AF
ZIW

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Applicants: Bednorz et al.

Serial No.: 08/479,810

Filed: June 7, 1995

Date: November 27, 2006

Docket: YO987-074BZ

Group Art Unit: 1751

Examiner: M. Kopec

For: NEW SUPERCONDUCTIVE COMPOUNDS HAVING HIGH TRANSITION TEMPERATURE, METHODS FOR THEIR USE AND PREPARATION

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF MAILING UNDER 37 CFR 1.8 (a)

I hereby certify that the attached correspondence comprising:

Appeal Brief Consisting of Volumes 1-5
Return Postcard

is being deposited with the United States Postal Service as first class mail in an envelope addressed to:

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

on November 27, 2006

Daniel P. Morris
(Type or printed name of person mailing paper or fee)

(Signature of person mailing paper or fee)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Applicants: Bednorz et al.

Serial No.: 08/479,810

Filed: June 7, 1995

Date: November 27, 2006

Docket: YO987-074BZ

Group Art Unit: 1751

Examiner: M. Kopec

For: NEW SUPERCONDUCTIVE COMPOUNDS HAVING HIGH TRANSITION TEMPERATURE, METHODS FOR THEIR USE AND PREPARATION

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

Pursuant to 35 U.S.C. 134 and 37 C.F.R. 41.37, entry of this Appeal Brief in support of the Notice of Appeal filed April 20, 2006 in the above-identified matter is respectfully requested. This appeal is from the final rejection in the Office Action dated 10/20/2005, referred to herein as the Final Action. The Final Action incorporates reasons for rejection from the Office Action dated 07/28/2004, which is referred to herein as the Office Action of 07/28/2004.

In compliance with the requirements of CFR 37 §41.37(c)(1)(*i*) to 37 CFR 37 §41.37(c)(1)(*x*) are the following Parts **I** to **X** ,respectively.

This Appeal Brief is being submitted as five volumes: Volume 1, Volume 2, Volume 3, Volume 4 and Volume 5.

This document is:

VOLUME 1

Part I

CFR 37 §41.37(c)(1)(*i*)

Statement of Real Party in Interest

The real party in interest in the above-identified patent application is the International Business Machines Corporation, Armonk, New York.

Part II

CFR 37 §41.37(c)(1)(*ii*)

Related Appeals and Interferences

There are no prior or pending appeals or interferences related to this application to Appellant's knowledge. Copending parent Application Serial Number 08/303,561 filed 09-Sep-1994 has been suspended pending the outcome of this appeal since essentially the same issues are presented therein. The present Application Serial Number 08/479,810 is a Continuation of Application Serial 08/303,561 filed 09/09/94 which is a Continuation of Application Serial Number 08/060,470 filed 05//11/93 which is a Continuation of Application Serial Number 08/875,003 filed 04/25/92 which is a Division of Application Serial Number 07/053,307 filed 05/22/87 (all referred to herein as The Ancestral Applications of the present application.)

Part III

Status of Claims
CFR 37 §41.37(c)(1)(*iii*)

A. Claim Status

Claims allowed as indicated in the "Eleventh Supplementary Response" to the Final Action are: 65, 77-81, 86, 87, 97-99, 103-108, 113, 114, 123-125, 135-138, 140, 144, 145, 150-152, 156-161, 167-181, 185, 186, 189-191, 196, 197, 213-216, 220, 221, 224-226, 231, 235, 236, 241-243, 247-252, 258-267, 269-272, 276, 277, 280-282, 287, 288, 296-301, 304-307, 311, 312, 315-317, 330, 335, 336, 346, 358, 375, 377, 378, 381, 384-388, 390-393, 396-401, 403-406, 409-413, 502-507, 511-515. (Applicants believe that claims 379 and 380 should not be rejected but should be allowed for the same reasons that claims 77 and 80, respectively, are allowed)

Claims rejected as indicated in the "Eleventh Supplementary Response" to Final Action are: 1-64, 66-72, 84, 85, 88-96, 100-102, 109-112, 115-122, 126-134, 139, 141-143, 146-149, 153-155, 162-166, 182-184, 187, 188, 192-195, 198-212, 217-219, 222, 223, 227-230, 232-234, 237-240, 244-246, 253-257, 268, 273-275, 278, 279, 283-286, 289-295, 302, 303, 308-310, 313, 314, 318-329, 331-334, 337-345, 347-357, 359-374, 376, 379, 380, 382, 383, 389, 394, 395, 402, 407, 408, 414-501, 508-510, 515-543. (Applicants believe that claims 379 and 380 should not be rejected but should be allowed for the same reasons that claims 77 and 80, respectively, are allowed)

Claims withdrawn are: 73-76, 82, 83, 377 and 378.

B. Appealed Claims

All rejected claims are appealed. Claims 1-64, 66-72, 84, 85, 88-96, 100-102, 109-112, 115-122, 126-134, 139, 141-143, 146-149, 153-155, 162-166, 182-184, 187, 188, 192-195, 198-212, 217-219, 222, 223, 227-230, 232-234, 237-240, 244-246, 253-257, 268, 273-275, 278, 279, 283-286, 289-295, 302, 303, 308-310, 313, 314, 318-329, 331-334, 337-345, 347-357, 359-374, 376, 379, 380, 382, 383, 389, 394, 395, 402, 407, 408, 414-501, 508-510, 515-543. (Applicants believe that claims 379 and 380 should not be rejected but should be allowed for the same reasons that claims 77 and 80, respectively, are allowed) are each appealed individually. None of these claims are appealed in a group except as indicated in Preliminary Comment A in Volume 3.

A clean copy of these claims is contained in the Claim Appendix of Part VII to this Appeal Brief.

Part IV

CFR 37 §41.37(c)(1)(*iv*)

Status of Amendments

1) The Response dated April 19, 2006 entitled "Third Amendment After Final Rejection" only corrected typographical errors in the listing of claims in the Response submitted April 12, 2006. Examiner Kopec, in a telephone interview, indicated that the Response dated April 19, 2006 was entered even thought there is no paper in the record acknowledging receipt or entry of the Response submitted April 19, 2006.

2) The Response submitted July 6, 2006 entitled "Fourth Response After Final Rejection", has been entered by Advisory Action dated 08/14/2006.

3) The Response submitted 07/11/2006 entitled "Fifth Response After Final Rejection", and the Response submitted 07/25/2006 entitled "Sixth Supplemental Response" have been entered by Advisory Action dated 08/29/2006 which withdraws the rejections of all claims under 35 USC 112, second paragraph.

4) The Response After Final Rejection submitted 09/13/2006 entitled "Seventh Supplemental Response" has not been responded to with an Advisory Action.

5) The Response After Final Rejection submitted 09/18/2006 entitled "Eighth Supplemental Response" has not been responded to with an Advisory Action.

6) The Response After Final Rejection submitted (11/06/2006) entitled "Tenth Supplemental Response" has not been responded to with and Advisory Action.

7) The Response After Final Rejection submitted (11/13/2006) entitled "Ninth Supplemental Response" has not been responded to with and Advisory Action.

8) The Response After Final Rejection submitted (11/16/2006) entitled "Eleventh Supplemental Response" has not been responded to with and Advisory Action.

9) The Response After Final Rejection submitted (11/21/2006) entitled "Twelfth Supplemental Response" has not been responded to with and Advisory Action.

10) The Response After Final Rejection submitted (11/25/2006) entitled "Thirteenth Supplemental Response" has not been responded to with and Advisory Action.

11) The Response After Final Rejection submitted (11/25/2006) entitled "Fourteenth Supplemental Response" has not been responded to with and Advisory Action.

12) The Response After Final Rejection submitted (11/27/2006) entitled "Fifteenth Supplemental Response" has not been responded to with and Advisory Action.

Part V

CFR 37 §41.37(c)(1)(*v*)
Summary of Claimed Subject Matter

Applicants in 1986 discovered that ceramic materials have superconductive critical temperatures (Tc) of greater than or equal to 26 K. Applicants were awarded the Nobel Prize in Physics in 1987 for this discovery..

Applicants' claims are directed to a superconductive device, apparatus, structure, etc. carrying a superconductive current in an electrical element having a (Tc) of greater than or equal to 26 K.

Applicants and no other persons received a Nobel Prize for this invention since this was not know prior to their discovery.
Subsequent discoverers of species that come within the scope of Applicants' rejected claims, did not share in Applicants' Nobel Prize and were not awarded an independent Nobel Prize.

In Volume 2 of the Appeal Brief a summary is provided of each rejected claim and where support for these claims is found in the first filed Ancestral Application Number 07/053, 307 filed 05/22/1987.

The Summary of each claim uses the version of the claims from the "Thirteenth Supplementary Response" submitted 11/25/2006 which was not entered when this Brief was filed. Changes to the claims in the "Thirteenth Supplementary Response" does not change the amended claims or the support thereof in the specification.

The summary of each claim shows that the electrical element that carries the superconductive current preferably has one or more the following properties (referred to as Applicants' High Tc Properties) :

- Is a ceramic
- Is ceramic like
- Comprises a ceramic characteristic
- Is an oxide
- Comprises oxygen
- Comprises oxygen in stochiomeric amount
- Comprises oxygen in nonstochiomeric amount
- Comprises a metal
- Comprises a transition metal
- Comprises copper
- Comprises a metal oxide
- Comprises a transition metal oxide
- Comprises copper oxide
- Comprises a multivalent metal
- Comprises a multivalent transition metal
- Comprises a multivalent copper
- Is layered
- Is layer-like
- Is layer-type
- Comprises a layered characteristic
- Is a perovskite
- Is perovskite like
- Is perovskite type
- Is perovskite related
- Substantially perovskite
- Comprises a perovskite characteristic
- Comprises a Group IIA element
- Comprises a Group IIIB element
- Comprises a rare earth element

- Comprises a rare earth like element
- Comprises a rare earth characteristic
- Is mixed valent
- Comprises a multivalent metal
- Comprises a multivalent transition metal
- Comprises a multivalent copper
- Comprises a mixed valent metal ions
- Comprises a mixed valent transition metal ions
- Comprises a mixed valent copper ions
- Comprises a substantially layered perovskite crystal structure
- Comprises a substituted transition metal oxide.
- Comprises four elements no one of which is a superconductor
- Comprising one or more of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
- Comprising one or more of of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
- The sentenced bridging page 1 and 2 of the specification states "Generally, superconductivity is considered to be a property of the metallic state of a material since all known superconductors are metallic under the conditions that cause them to be superconducting. A few normally non-metallic materials, for example, become superconducting under very high pressure wherein the pressure converts them to metals before they exhibit superconducting behavior."
- With or without any of the forgoing properties the electrical element that carries the superconductive current can be made according to known principle of ceramic science

(This list is exemplary only and is not limiting and is not intended to introduce limitations into Applicants' claims.)

These Applicants' High Tc Properties identify properties that the species of superconducting elements, describe in the specification, may possess. The

recitation of these properties provide direction for persons of skill in the art to look for other species, having these properties, that superconduct at a temperature greater than or equal to 26 K.

As described below no undue experimentation is needed to make such species and therefore, Applicants do not have to provide "guidance" on how to do experimentation which involves undue experimentation without such guidance and where those experiments were not actually performed by Applicants.

A few of the claims will be discussed here. As stated above detailed comments on each appealed claim is in Volume 2.

CLAIMS 438 TO 465

CLAIM 438 recites

> An apparatus comprising: a means for conducting a superconducting current at a temperature greater than or equal to 26°K and a means for providing an electric current to flow in said means for conducting a superconducting current.

In this claim the element carrying the superconducting current is in means plus function form. Means for conducting a superconducting current at a temperature greater than or equal to 26°K are described at page 3, line 1 to page 28, line 5 of the specification.

CLAIM 439 adds the structural property that for the apparatus described in claim 438 the "means for conducting a superconductive current comprises a T_c greater than or equal to 26°K."

CLAIM 440 adds to the apparatus of claim 438 "a temperature controller for maintaining said means for conducting a superconducting current at a said temperature."

The "means for conducting a superconducting current" in each of claims 438. 439 and 440 is defined to have the following list of structural properties in the claim identified:

- CLAIM 441 - comprises oxygen.
- CLAIM 442 – comprises one or more of the groups consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
- CLAIM 443 – comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
- CLAIM 444 – comprises a layered structure.
- CLAIM 438 – comprises a substantially perovskite structure.
- CLAIM 446 – comprises a perovskite-like structure.
- CLAIM 447 – comprises a perovskite related structure.
- CLAIM 448 – comprises a structure having a perovskite characteristic.
- CLAIM 449 – comprises a transition metal.
- CLAIM 450 – comprises a copper oxide.
- CLAIM 451 – comprises oxygen in a nonstoichiomeric amount.

- CLAIM 452 - comprises a multivalent transition metal.

- CLAIM 453 - the means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 454-465 depend respectively from claims 441 to 452, wherein the "means for conducting a superconducting current can be made according to known principles of ceramic science."

Consequently, the claim set 438 to 465 have claims 438 and 440 which recite the element carrying the superconducting current in means plus function form ("a means for conducting a superconducting current at a temperature greater than or equal to 26°K") and claims 439 and 441 to 465 recite structural properties corresponding to this means.

These structural properties identify properties that the species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIM 466

Claim 466 recites:

> CLAIM 466 An apparatus comprising:
>
> a superconductive current carrying element comprising a T_c greater than or equal to 26°K;
>
> said superconductive current carrying element comprises a property selected from one or more of the group consisting of

a mixed valent oxide, a transition metal, a mixed valent transition metal, a perovskite structure, a perovskite-like structure, a perovskite related structure, a layered structure, a stoichiomeric or nonstoichiomeric oxygen contents and a dopant.

This claim recites that the "superconductive current carrying element comprises a property selected from one or more of the group consisting of a:"

- a mixed valent oxide,
- a transition metal,
- a mixed valent transition metal,
- a perovskite structure,
- a perovskite-like structure,
- a perovskite related structure,
- a layered structure,
- a stoichiomeric or nonstoichiomeric oxygen contents and a
- dopant.

These structural properties identify properties that the species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIMS 466 TO 473

Claim 476 recites:

CLAIM 476 An apparatus comprising:

a superconductive current carrying element comprising a T_c greater than or equal to 26°K

said superconductive current carrying element comprises an oxide, a layered perovskite structure or a layered perovskite-like structure and comprises a stoichiomeric or nonstoichiomeric oxygen content.

This claim recites that a "superconductive current carrying element comprises" the properties:

- an oxide,
- a layered perovskite structure or a layered perovskite-like structure and
- a stoichiomeric or nonstoichiomeric oxygen content.

CLAIM 467 more specifically defines the apparatus according to claim 466 to be wherein said superconductive current carrying element is at a temperature greater than or equal to 26 K.

CLAIM 468 adds to the apparatus according to claim 466, a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

The superconductive current carrying element of claims 466, 467 or 468 comprises:

- CLAIM 469 - one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
    - CLAIM 471 adds to CLAIM 469 - a transition metal.
        - CLAIM 474 adds to f claim 471, wherein said superconducting current carrying element can be made according to known principles of ceramic science.

- CLAIM 470 - one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
    - CLAIM 472 adds to claim 470 - a transition metal.
        - CLAIM 475 adds to 472, wherein said superconducting current carrying element can be made according to known principles of ceramic science.

- CLAIM 473 adds to claims 466, 467, or 468, the property wherein said superconducting current carrying element can be made according to known principles of ceramic science.

These structural properties identify properties that the species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIMS 476 TO 491

Claim 476 recites

CLAIM 476 An apparatus comprising:

a superconductive current carrying element comprising a T_c greater than or equal to 26 K'

said superconductive current carrying element comprises an oxide, a layered perovskite structure or a layered perovskite-like structure and comprises a stoichiomeric or nonstoichiomeric oxygen content.

In this claim the superconductive current carrying element comprises

- an oxide,
- a layered perovskite structure or a layered perovskite-like structure and
- comprises a stoichiomeric or nonstoichiomeric oxygen content.

CLAIM 477 more specifically defines the apparatus according to claim 476 to be wherein said superconductive current carrying element is at a temperature greater than or equal to 26 K.

CLAIM 478 adds to the apparatus according to claim 476 a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

The " superconductive current carrying element" of claims 476, 477 or 478 is defined to have the following list of structural properties in the claim identified:

- CLAIM 479 - one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
    - CLAIM 481 – adds to claim 479, wherein said superconductive current carrying element comprises a transition metal.

- CLAIM 480 - one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
    - CLAIM 482 – adds to claim 480, wherein said superconductive current carrying element comprises a transition metal.

- CLAIM 483 - copper oxide.

CLAIM 484 more specifically defines the apparatus according to anyone of claims 476, 477 or 478 to be wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIMS 485 to 491 add to claims 479 to 484 respectively "wherein said superconductive current carrying element can be made according to known principles of ceramic science."

These structural properties identify properties that species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIM 496

Claim 496 recites:

> CLAIM 496 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:
>
> (a) a superconductor element made of a superconductive composition, the superconductive composition comprising a copper-oxide compound having a crystal structure comprising a perovskite related structure and a layered characteristic, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;
>
> (b) means for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element

This claim recites that a "a superconductor element made of a superconductive composition, the superconductive composition comprising" the properties:

- a copper-oxide compound
- having a crystal structure comprising a perovskite related structure and
- a layered characteristic,

These structural properties identify properties that species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIMS 517 TO 521

Claim 517 recites:

CLAIM 517 An apparatus comprising:

a superconductive current carrying element comprising a T_c greater than or equal to 26 K;

said superconductive current carrying element comprises a metallic, oxygen-deficient, perovskite-like, mixed valent copper compound.

This claim states that the "superconductive current carrying element" comprises:

- o a metallic,
- o oxygen-deficient,

- perovskite-like,
- mixed valent copper compound.

CLAIM 518 more specifically defines the apparatus according to claim 517 to be wherein said superconductive current carrying element is at a temperature greater than or equal to 26 K.

CLAIM 519 adds to the apparatus according to claim 517 a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

The " superconductive current carrying element" of claims 517, 518 or 519 is defined to have the following list of structural properties in the claim identified:

- CLAIM 520 - one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho Er, Tm, Yb and Lu.

- CLAIM 521 - one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

These structural properties identify properties that species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIMS 522 TO 534

Claim 522 recites:

CLAIM 522 An apparatus comprising:

a superconductive current carrying element comprising a T_c greater than or equal to 26 K;

said superconductive current carrying element comprises a composition that can be made according to known principles of ceramic science.

This claim recites that a "a superconductor element made of a superconductive composition, the superconductive composition comprises" the properties :

- o "that can be made according to known principles of ceramic science."

CLAIM 523 more specifically defines the apparatus of claim 522 to be wherein the superconductive current carrying element is at a temperature greater than or equal to 26 K.

CLAIM 524 adds to the apparatus according to claim 523 a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

CLAIM 529 adds that the superconductive current carrying element comprises copper oxide.

The " superconductive current carrying element" of claims 522, 523 or 524 is defined to have the following list of structural properties in the claim identified:

- o CLAIM 525 - one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

- CLAIM 527 – adds to claim 525 comprises a transition metal.

- CLAIM 526 - one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
  - CLAIM 528 – adds to claim 527 comprises a transition metal.

- CLAIM 530 - substantially perovskite.

- CLAIM 531 - a perovskite-like structure.

- CLAIM 532 - a perovskite related structure.

- CLAIM 533 - a nonstoichiometric amount of oxygen.
- CLAIM 534 - a layered structure.

These structural properties identify properties that species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CALIM 59

Claim 59 recites:

> CLAIM 59 A combination, comprised of:
> a ceramic-like material having an onset of superconductivity at an onset temperature greater than or equal to 26°K,
>
> means for passing a superconducting electrical current through said ceramic-like material while said material is maintained at a temperature greater than or equal to 26°K and less than said onset temperature, and

means for cooling said superconducting ceramic-like material to a superconductive state at a temperature greater than or equal to 26°K and less than said onset temperature, said material being superconductive at temperatures below said onset temperature and a ceramic at temperatures above said onset temperature.

This claim recites a "a ceramic-like material having an onset of superconductivity at an onset temperature greater than or equal to 26°K,"

These structural properties identify properties that species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIM 146 TO 148

Claim 146 recites:

CLAIM 146 An apparatus:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a current source passing an electrical current through said composition while said composition is in said superconductive state.

The claim recites "a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K."

CLAIM 147 mores specifically defines the apparatus of claim 146 to be where said composition is comprised of a metal oxide.

CLAIM 148 mores specifically defines the apparatus of claim 146 to be where said composition is comprised of a transition metal oxide.

These structural properties identify properties that species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIM 536

Claim 536 recites:

CLAIM 536 An apparatus comprising:

a means for carrying a superconductive current exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a cooler for cooling said composition to a temperature greater than or equal to 26°K at which temperature said means for carrying a superconductive current exhibits said superconductive state, and

a current source for passing an electrical current through said composition while said composition is in said superconductive state.

In this claim the element carrying the superconducting current is in means plus function form. Means for conducting a superconducting current at a temperature greater than or equal to 26°K are described at page 3, line 1 to page 28, line 5 of the specification.

These structural properties identify properties that species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIM 537

Claim 537 recites:

CLAIM 537 An apparatus comprising:

a metallic, oxygen-deficient, perovskite-like, mixed valent transition metal composition exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a current source passing an electrical current through said composition while said composition is in said superconductive state.

This claim recites that a "composition exhibiting a superconductive state at a temperature greater than or equal to 26°K" comprising the properties :

- a metallic,
- oxygen-deficient,
- perovskite-like,
- mixed valent transition metal composition

These structural properties identify properties that species of superconducting elements, describe in the specification, possess. The recitation of these properties provide direction for persons of skill in the art to look for other species having these properties that superconduct at a temperature greater than or equal to 26 K.

CLAIMS 540 TO 542

Claim 540 recites:

CLAIM 540 An apparatus comprising:

a composition comprising oxygen exhibiting a superconductive state at a temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a source of an electrical current through said composition while said composition is in said superconductive state.

This claim states that the composition exhibiting a superconductive state at a temperature greater than or equal to 26°K comprises oxygen.

CLAIM 541 further defines claim 540 to be where said composition is comprised of a metal oxide.

CLAIM 542 further defines claim 541 to be where said composition is comprised of a transition metal oxide.

CONCLUSION

The description of Applicants' claims above is for illustration purposes and in view of the large number of claims under appeal to facilitate recognition of the organizational structure. For purposes of prosecution history estoppel no limitations are included in the claims by this description. In Volume 2 of this Appeal Brief there is description of each claim under appeal. For purposes of prosecution history estoppel no limitations are included in the claims by those descriptions. A number of Applicants claims refer to a means for passing a current and a means for cooling the superconducting element. The "Fourteenth Supplemental Response" submitted 11/25/2006, which was not entered at the time of submission of this Brief, provides a reference in Attachment A thereof, which is Brief Attachment BL, published in 1986 giving a summary of temperature control apparatus. Brief Attachment BL is the table of contents, the Preface and Chapter 1 of the book "Cryogentic Engineering" by B. A. Hands, Copyright 1986, Published by Academic Press, Inc. Chapter 1 is entitled "Survey of Cryogenic Engineering." This is being provided to show the general state of the art of apparatus for controlling temperature to be in low temperature ranges as used in superconductivity. Superconductivity was discovered in 1911 and apparatus to control temperature are well know in the art.

The "Thirteenth Supplementary Response" submitted 11/25/2006 changes terminology such as "means for passing a current" to "a current source" which is a term used in allowed claims and changes the terminology "means for cooling" to "a temperature controller" which is a term used in allowed claims These are commonly known and used elements since 1911 when superconductivity was first discovered. Pages 1 and 2 of the specification describe technologies using superconductors such as the Josephson junction technology which extensively uses current sources and cooling systems. Current sources are commonly used in the electronic arts and do not need detailed description. Apparatus for

controlling temperature fo superconductivity are well known in the art and do not need description.

Part VI

CFR 37 §41.37(c)(1)(*vi*)

Grounds of Rejection to be reviewed on appeal

1) Claims 1-64, 66-72, 84, 85, 88-96, 100-102, 109-112, 115-122, 126-134, 139, 141-143, 146-149, 153-155, 162-166, 182-184, 187, 188, 192-195, 198-212, 217-219, 222, 223, 227-230, 232-234, 237-240, 244-246, 253-257, 268, 273-275, 278, 279, 283-286, 289-295, 302, 303, 308-310, 313, 314, 318-329, 331-334, 337-345, 347-357, 359-374, 376, 379, 380, 382, 383, 389, 394, 395, 402, 407, 408, 414-501, 508-510, 515-543 (Applicants believe that claims 379 and 380 should not be rejected but should be allowed for the same reasons that claims 77 and 80, respectively, are allowed) have been rejected under 35 U.S.C. 112, first paragraph, because as stated by the Examiner "the specification, while being enabling for compositions comprising a transition metal oxide containing at least a) an alkaline earth element or Group IIA element and b) a rare-earth element or Group IIIB element, does not reasonably provide enablement for the invention as claimed."

2) Applicants request the claim of priority in paper submitted 04/27/1998 be granted. The Examiner did not respond to Applicants' arguments in support thereof in Applicants' responses of 08/02/1999, 03001/2004 and other responses. The Decision on the Pre-Appeal Brief did not respond to Applicants' request to be granted the claimed priority. In the alternative Applicants request entry of a statement in the record that this issue does not have to be decided to resolve the issues in this appeal and thus the denial of priority is withdrawn and left as an issue not decided on.

Applicants' note that the Notice of Panel Decision from Pre-Appeal Brief Review dated May 19, 2006 did not respond to any of Applicants' issues or arguments in the Pre-appeal Brief submitted April 20, 2006.

Part VII

CFR 37 §41.37(c)(1)(*vii*)

Argument

Preliminary Comment

Part A

Applicants note that the USPTO participants on the Notice of Panel Decision from Pre-Appeal Brief Review dated 05/19/2006 are: Mark Kopec, Douglas McGinty and Gregory Mills. Mark Kopec of Group Art Unit 1751 is the current Examiner of record for the present application. Douglas McGinty is the Supervisory Patent Examiner of Group Art Unit 1751. Douglas McGinty was the Examiner of record of the parent application of the present application and was the Examiner of record in the present application from the filing date, June 7, 1995, until at least July 30, 1998 which is the last paper in the record of the current application signed by then Examiner McGinty. The issues on appeal were first raised by then Examiner McGinty and sustained by current Examiner Kopec. Thus two of the three members of the Pre-Appeal Brief review panel were reviewing their own rejections. Since two members of the review panel were Examiners of the present application, to the extent that the Notice of Decision on the Pre-Appeal Brief reaffirms the prosecution history, Applicants believe that no deference or weight should be given to the result of the Notice of Panel Decision from Pre-Appeal Brief Review.

Reference to attachments to this Appeal Brief are Brief Attachment # for Appeal Brief Attachment number.

The Final Action of 10/20/2005, which is the basis of this appeal will be referred to herein as the Final Action. The Final Action incorporates portions of the Office Action dated 07/28/2004, which will be referred to herein as Office Action 07/28/2004 or as OA 07/28/2004.

Preliminary Comment
Part B

In the Final Action Claims 1-5, 7-11, 17, 19, 23, 28, 52-54, 59, 65, 72, 77-81, 86, 87, 94, 96-108, 144, 145, 149, 150, 152-156, 158-161, 165, 166, 170, 171, 175, 176, 180, 181, 235, 236, 240, 241-252, 257, 261, 262, 266, 267, 271, 272, 361-413, 414-427, 433, 434, 446, 448, 466-495 and 537-539 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite. The rejection of these claims is based on terms which the Examiner has stated were indefinite for the first time in the ancestral applications of the present application. (See Appl. Ser. No. 07/053,307 Office Actions dated 08/08/1990 and 04/25/1991 in which claim terms were rejected as indefinite.) Notwithstanding, Applicants having submitted extensive documentary and affidavit evidence showing that the terms, rejected as indefinite, were well known and understood in the ceramic arts, in issued US Patents and the claims of those patents, the Examiner did not withdraw the rejections for indefiniteness until Applicants submitted on 07/11/2006 the "Fifth Response After Final Rejection" and submitted on 07/25/2006 the response after final rejection entitled "Sixth Response After Final Rejection". The repeated maintaining of the indefinite rejections substantially contributed to the long pendency of this application. The rejection for indefiniteness was withdrawn based on Aplicants' arguments first given in the Ancestral Application Serial Number 07/053,307 filed 05/22/1987.

Preliminary Comment
Part C

As described in detail below during the long prosecution history of the present application many of Applicants' claims rejected as not enabled, were repeatedly rejected as anticipated or obvious (under 35 USC 102, 103) over the Asahi Shinbum Article (Brief Attachment AV). The Asahi Shinbum Article merely states that a researcher in Japan reproduced Applicants' work. Applicants repeatedly argued, inter alia, that the Asahi Shinbum Article was not a reference under 35 USC 102 since alone it was not enabling and for enablement it relied on Applicants' Article (Brief Attachment AX) which is incorporated by reference at page 6 of Applicants' specification. The Examiner repeatedly rejected Applicants' argument for why the Asahi Shinbum article was not a reference under 35 USC 102. Applicants avoided the Asahi Shinbum Article by swearing behind it though affidavits submitted during the prosecution of Applicants' first filed application, Ser. No. 07/053,307. In View of their affidavits the Examiner withdrew the rejections over the Asahi Shinbum article. In view of this Applicants have argued in numerous responses that it necessarily follows from the withdrawn rejections of Applicants' claims under 35 USC 102 and 103 over the Asahi Shinbum Article that Applicants' claims are enabled in the view of the Examiner's rejection since for a single reference to anticipate or render obvious claims, the reference must be enabling. Since the enablement of the Asahi Shinbum Article requires Applicants' teaching, Applicants' teaching is enabling of Applicants' claims . In order to avoid Applicants' arguments the Final Action states at the bottom of page 12 "Even if this disclosure were available as a prior art publication the Examiner contends that the article may not be applied as operable prior art." The Examiner is here agreeing with Applicants' first argument, made in 1992 when this reference was first cited. The repeated rejection of Applicants claims over the Asahi Shinbum Article and the Examiner's refusal to agree that it was not a reference under 35 USC 102 has substantially contribute to the long pendency of this application.

Preliminary Comment
Part D

Attachments herein use the following identification scheme. The Attachments are Brief Attachments A to Z followed by Brief Attachments AA to AZ, followed by Brief Attachments BA to BL. This identification scheme is used so that reference to attachments in the argument herein will use the same identification that is used by a number of lengthy affidavits submitted during the prosecution that are referred to in the argument herein.

Applicants note that the DST AFFIDAVITS (Brief Attachments AM, AN and AO) in ¶ 2 thereof refer to Attachments A to Z and AA of the "FIRST SUPPLELMENTAL AMENDMENT" in response to Office Action date July 28, 2004 and to Attachments AB to AG of the "THIRD SUPPLEMENTAL AMENDMENT" in response to the Office Action dated July 28, 2004. These attachments are the same as Brief Attachments A to Z and AA to AG.

Part VIII Section 1
CFR 37 §41.37(c)(1)(*viii*)
Summary of Argument

SUMMARY OF ARGUMENT SUBSECTION A
CLAIM OF PRIORITY TO PRIORITY DOCUMENT

Applicants request the claim of priority in their paper submitted 04/27/1998 be granted. The Examiner did not respond to Applicants' arguments in support thereof in Applicants' responses of 08/02/1999, 03001/2004 and other responses. Alternatively, Applicants request entry of a statement that this issue does not have to be decided to resolve the issues in this appeal and thus the denial of priority is withdrawn and left as an issue undecided.

In their paper submitted 04/27/1998 Applicants claimed, under 35 USC Section 119, the priority of an application filed on 23 January 1987 on their behalf

in the European Patent Office as European patent application Serial No. 87100961.9 (referred to herein as "the European '961 patent application" or the Priority Document). Submitted in the parent application of the present application were (1) a certified copy of the European '961 application upon which the claim to priority is based; and (2) a supplemental Declaration and Power of Attorney for the application duly executed by the applicants, Drs. Bednorz and Mueller on 4 February 1992 and 28 February 1992, respectively, in which a claim of priority under 35 USC Section 119 to the European '961 application is made.

SUMMARY OF ARGUMENT SUBSECTION B
REJECTIONS UNDER 35 USC 112 ¶ 1 FOR LACK OF ENABLEMENT

Claims 1-64, 66-72, 84, 85, 88-96, 100-102, 109-112, 115-122, 126-134, 139, 141-143, 146-149, 153-155, 162-166, 182-184, 187, 188, 192-195, 198-212, 217-219, 222, 223, 227-230, 232-234, 237-240, 244-246, 253-257, 268, 273-275, 278, 279, 283-286, 289-295, 302, 303, 308-310, 313, 314, 318-329, 331-334, 337-345, 347-357, 359-374, 376, 379, 380, 382, 383, 389, 394, 395, 402, 407, 408, 414-501, 508-510, 515-543 (Applicants believe that claims 379 and 380 should not be rejected but should be allowed for the same reasons that claims 77 and 80, respectively, are allowed) are rejected under 35 U.S.C. 112 ¶ 1, as not enabled.

SUMMARY OF ARGUMENT SUBSECTION B (i)
REJECTIONS UNDER 35 USC 112 ¶ 1 FOR LACK OF ENABLEMENT
CLAIMS IN MEANS PLUS FUNCTION FORM

In Claims 438, 440 and 536 the “means for superconductive current” is in means plus function form. MPEP § 2181 Part II states "35 U.S.C. 112, sixth paragraph states that a claim limitation expressed in means-plus-function language 'shall be construed to cover the corresponding structure described in the specification and equivalents thereof.'" The Examiner has allowed claims 113, 114, 123-125, 135-

138,140,151, 157, 167-169, 172-174, 177-179, 185, 186, 189-191, 197, 213-216, 220, 221 , 224-26, 231, 258-260,, 264, 265, 269, 270, 276, 277, 280-282, 287, 288, 296-301, 304-307, 311, 312, 315-317, 502-507, at page 4 of the Final Action, stating these claims are allowed "because the specification, [is] enabling for compositions comprising a transition metal oxide containing at least a) an alkaline earth element or Group IIA element and b) a rare-earth element or Group IIIB element" Thus since the Examiner has allowed claims to specific examples described in the specification, the claims in means plus function form can not be rejected as not being enabled and the rejection should be reversed. It is Applicants' view that the CAFC decision In re Donaldson 29 USPQ2d 1845 (1994) requires this result.

SUMMARY OF ARGUMENT SUBSECTION B (ii)
REJECTIONS UNDER 35 USC 112 ¶ 1 FOR LACK OF ENABLEMENT
CLAIMS NOT IN MEANS PLUS FUNCTION FORM

The key issue of this appeal is whether the generic claims under appeal satisfy the requirements of 35 USC 112, first paragraph, and are thus enabled. Applicants disclosed methods well known in the prior art to fabricate specific examples of a number of high Tc superconducting materials and stated that other species were made by the same known principals of ceramic science and equivalents thereof. During the prosecution of this application other species of high Tc superconductors have been made. It is Applicants' understanding of the Examiner's comments in the Final Action that the Examiner agrees "that once a person of skill in the art knows of a specific type of composition which is superconducting at greater than or equal to 26K, such a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions. " Since the known methods disclosed by Applicants are used to fabricate species within the scope of Applicants claims, it is Applicants' position that persons of skill in the art can determine those species without undue experimentation and consequently, Applicants have

enabled their claims to their full scope. When species are determinable without undue experimentation, the art is a predictable art. Even though a high Tc material is a chemical composition, all aspects or chemistry are not unpredictable. That chemistry is not per se unpredictable is generally recognized by decisions of the Board and the Courts, for example at 427 F.2d 833, 839 states "In cases involving unpredictable factors such as most chemical reactions." Applicants' evidence shows that the chemistry involved in formation of high Tc materials does not have to be understood to fabricate them which is one reason for why species are readily determinable. If the chemistry does not have to e understood to fabricate species, it is improper ipso facto to refer to the art of high Tc super-conductivity as unpredictable. Applicants' claims are directed to an apparatus using the high Tc material and not to a composition of matter.

At page 8 of the Final Action the Examiner states:

> The Examiner does not deny that the instant application includes "all know principles of ceramic science", or that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to 26K, such a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions. The numerous 1.132 declarations, such as those of Mitzi, Shaw, Dinger and Duncombe, and the Rao article, are directed to production of know superconductive materials. (Emphasis in the original)

Thus the Examiner agrees that "a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions." The principals of ceramic science taught by Applicants to fabricate high Tc Superconductors were known long before Applicants' discovery.

The following claims recite that the high Tc element of the claims from which these claims depend "can be made according to known principles of

ceramic science" or similar recitation: dependent claims 322 to 360, 414 to 427, 436, 453 to 465, 473 to 475, and 484 to 491 independent claim 522 and newly added dependent claims 544-551, which are not entered at the time of this Appeal Brief. Of these claims the following are allowed: 330, 335, 336, 346 and 358.

At page 6 of the Final Action the Examiner further states:

> "What is not a "matter of routine experimentation" in this complex, unpredictable art is arriving at superconductive compositions outside the scope of the allowable claims (e.g., subsequently discovered BSCCO or Tl-systems as disclosed in Rao (see response filed 3/8/05, pages 141-143). The Examiner respectfully maintains that the instant disclosure has not provided sufficient guidance to produce such materials."

This statement is clearly inconsistent with In re Angstadt 190 USPQ 219 (CCPA 1976) and In re Wands 8 USPQ2d 1400 (CAFC 1988) which held that to satisfy the first paragraph of 35 USC 112 it is only necessary that a person of skill in the art not exercise undue experimentation to make samples that come within the scope of the Applicants' claims. The Examiner has provided no objective indication that undue experimentation was needed to make species to High T_c materials that come within the scope of Applicants' claims, e.g., the subsequently fabricated systems disclosed in Rao (Brief Attachment AB). Applicants have clearly shown that only routine experimentation is needed to fabricate other samples to practice Applicants' claimed invention. See the DST AFFIDAVITS (Affidavits of Shaw of 04/14/2005, Brief Attachment, Affidavit of Dinger of 04/04/2005 and Affidavit of Tsuei of 04/04/2005, Brief Attachment AM, AN and AO, respectively, collectively referred to herein as the DST AFFIDAVITS). Applicants respectfully disagree that the field of High Tc superconductivity is unpredictable within the meaning of the US patent law as suggested by the Examiner. See the affidavit of Newns submitted 04/12/2006 (Brief Attachment AP). The complex chemistry does not have to be understood to fabricate samples as stated in the book "Copper Oxide Superconductors" by Charles P.

Poole, et al. (See ¶ 48 of DST AFFIDAVITS and Brief Attachment AW) which states at page 59:

> [c]opper oxide superconductors with a purity sufficient to exhibit zero resistivity or to demonstrate levitation (Early) are not difficult to synthesize. We believe that this is at least partially responsible for the explosive worldwide growth in these materials.

Poole further states at page 61:

> [i]n this section three methods of preparation will be described, namely, the solid state, the coprecipitation, and the sol-gel techniques (Hatfi). The widely used solid-state technique permits off-the-shelf chemicals to be directly calcined into superconductors, and it requires little familiarity with the subtle physicochemical process involved in the transformation of a mixture of compounds into a superconductor.

Since skilled artisans can fabricate samples without knowing the chemistry and without a detailed theory, this art is predictable. All that is needed is routine experimentation to fabricate samples. There is no evidence to the contrary. The Examiner has cited no evidence to the contrary and has presented no argument to the contrary.

In In re Wands 858 F.2d 731, 742 (Fed. Cir. 1988); 8 U.S.P.Q.2D 1400, 1408 Judge Newman concurring in part, dissenting in part stated "[The inventor] must provide sufficient data or authority to show that his results are reasonably predictable within the scope of the claimed generic invention, based on experiment and/or scientific theory. " Thus experiment or theory is sufficient to establish predictability. And as stated above by the Examiner "a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions." There is no requirement to know in advance all examples enabled by their teaching. Thus the field of High Tc superconductivity is predictable within the meaning of In re Wands. Species within the scope of Applicants' claims are determinable by undue experimentation and testing.

The Examiner's reference to "subsequently discovered BSCCO or Tl-systems " suggests that it is the Examiner's view that for Applicants to be allowed a generic claim, Applicants must know in advance all materials that can be used to practice applicant's claims. The CAFC has stated in Sri Int'l v. Matsushita Elec. Corp., 775 F.2d 1107, 1121 (Fed. Cir. 1985); 227 USPQ 577, 586 that this is not necessary:

> The law does not require the impossible. Hence, it does not require that an applicant describe in his specification every conceivable and possible future embodiment of his invention. The law recognizes that patent specifications are written for those skilled in the art, and requires only that the inventor describe the "best mode" known at the time to him of making and using the invention. 35 U.S.C. § 112.

Applicants have shown that persons of ordinary skill in the art as of Applicants discovery can practice Applicants' claims to their full scope and it is Applicants' understanding of the Examiner's statements that the Examiner has agreed with this.

The CAFC has further stated:

> An applicant for patent is required to disclose the best mode then known to him for practicing his invention. 35 U.S.C. § 112. He is not required to predict all future developments which enable the practice of his invention in substantially the same way. Hughes Aircraft Co. v. United States, 717 F.2d 1351, 1362 (Fed. Cir. 1983);39 USPQ2d 1065.

This is exactly what applicants have done. Thus Applicants' claims are enabled.

The CAFC further states in regards to future developments:

> Enablement does not require the inventor to foresee every means of implementing an invention at pains of losing his patent franchise. Were it otherwise, claimed inventions would not include improved modes of practicing those inventions. Such narrow patent rights would rapidly become worthless as new modes of practicing the invention developed, and the inventor would lose the benefit of the patent bargain. Invitrogen Corp. v. Clontech Labs., Inc., 429 F.3d 1052, 1071 (Fed. Cir. 2005)" And, "Our case law is clear that an applicant is not required to describe in the specification every conceivable and possible future embodiment of his invention." Rexnord Corp. v. Laitram Corp., 274 F.3d 1336, 1344, 60 U.S.P.Q.2D (BNA) 1851 (Fed. Cir. 2001).

The Examiner's position in regards to the enablement of Applicants' claims is inconsistent with the CAFC's position that "[e]nablement does not require the inventor to foresee every means of implementing an invention." Thus Applicants' claims are enabled and the rejection should be reversed. The Examiner uses the term predictable with the meaning of "foresee." The correct meaning of the term "predictable" for enablement purposes is "determinable" without undue experimentation.

In support of the lack of enablement rejection the Examiner in the Final Action at page 4 refers to a article by Schuller et al. which states "Of course, 'enlightened' empirical searches either guided by chemical and materials intuition or systematic searches using well-defined strategies may prove to be fruitful. It is interesting to note that .... empirical searches in the oxides gave rise to many superconducting systems..." See the Affidavit of Newns submitted 04/12/2006 ¶ 18 (Brief Attachment AB). The DST AFFIDAVITS (Brief Attachments AM, AN and AO) describe what a person of skill in the art knew prior to Applicants' discovery upon which the systematic empirical study was based in view of Applicants' teaching. The Affidavit of News (Brief Attachment AP) shows how this systematic empirical study is in principal the same as a systematic theoretical investigation when a well developed theoretical formalism exists. Thus Schuller, rather than supporting the lack of enablement as contended by the Examiner, supports Applicants' position that their claims are enabled. Thus the art of high Tc superconductivity is determinable without undue experimentation and Applicants' claims are enabled. In the response submitted 01/28/2005 at pages 148-150 applicants applied the MPEP ¶ 2164.01(a) Undue Experimentation Factors from In re Wands. The Examiner has provided no rebuttal to this. The Examiner has not made a prima facie showing for lack of enablement since the Examiner has provided no reasons for why undue experimentation is required of a person of skill in the art to practice applicants claims. The Examiners statement at page 6 of the Final Action "[w]hat is not a 'matter of routine experimentation' in this complex, unpredictable art is arriving at

superconductive compositions outside the scope of the allowable claims" is an unsupported assertion. The Examiner has attempted to use the asserted lack of a complete theoretical understanding of the physical mechanism of High Tc Superconductivity at the time of its discovery as a reason to justify referring to the art as unpredictable. The Examiner has cited no authority to support is view. The Examiner does not refer to the patent statute (35 U.S.C.), the patent regulations (37 C.F.R.), the MPEP or to the decisions of the Board or of the Courts to support this conclusion. It is simply not correct that a lack of scientific theoretical understanding necessarily means that an art is unpredictable within the meaning this legal term of art has in the U.S. patent law. As stated above enablement does not require "forseeability" or the Examiner's view of "predictability." The Examiner states in the sentence bridging pages 7-8 of the Final Rejection:

> It is clear from these articles, published well after the filing date of the instant application, that the art is still considered complex and unpredictable, and that no single theory for the mechanism responsible for superconductivity has been generally accepted.

The Examiner is confusing the legal terms "predictability" and "unpredictability" of the patent law with the theoretical scientific term "theory" of the mathematical (theoretical) sciences, such as theoretical physics, chemistry and solid state science. The legal terms "predictability" and "unpredictability" are directed to the language of 35 USC 112 ¶ 1 "[t]he specification shall contain a written description ... of the manner and process of making and using [the invention]." The theoretical scientific term "theory" is not directed to "the manner and process of making and using [the invention]." Theoretical science can create a mathematical theory that "predicts" in the scientific sense that a chemical composition is energetically stable and can exist even though there is no know method of making that chemical composition. A patent applicant who files a patent application based on a theory that scientifically predicts with 100% accuracy (100% theoretical predictability) that a particular chemical composition, that did not exist prior to the filing date of that application, can exists, but where

that patent applicant does not disclose "the manner and process of making and using [the invention]," and where such knowledge is not know by persons of skill in the art as of the filing date, is not entitled to a patent because the patent application does not enable a person of ordinary skill in the art to practice the invention, notwithstanding that there is 100% theoretical predictability. Also, such work, if published, is not a prior art reference under 35 USC 102 because it does not "enable" practicing the described technology. On the other hand, a patent applicant who files a patent application on a chemical composition genus for which there is no know scientific theoretical theory, but for which the process of making the species, that come with in the scope of the claim, is known with precision has taught persons of skill in the art how to practice the claimed genus of the invention and thus the claimed genus invention is enabled. In a precedential decision the Board of Patent Appeals and Interferences in Ex parte Jackson 217 USPQ 804, 806 the Board states that a claim is enabled if Applicants teaching "would enable one of ordinary skill in the relevant art to independently discover additional" species within the scope of Applicants' claims. The Examiner has acknowledged that Applicants have done this and thus their claims are enabled.

At page 9 of the Final Action the Examiner further states:

> What is not a "matter of routine experimentation" ... is arriving at superconductive compositions outside the scope of the allowable claims ... The Examiner respectfully maintains that the instant disclosure has not provided sufficient guidance to produce such materials.

Again as with the patent legal terms "predictability" and "unpredictability," the patent legal term "guidance" is directed to "the manner and process of making and using [the invention]." When the teaching of a patent application requires undue experimentation to practice the invention, guidance on how to carry out the experiment can result in enablement even though the experimentation is not recorded as a performed example in the specification. As noted in the summary of the invention section above Applicants' teaching identifies properties that Applicants' examples possess which later discovered species also possess.

Thus Applicants;' teaching has more than is minimally necessary to satisfy enablement. As stated above by the Examiner at page 9 of the Final Action:

> The Examiner does not deny that the instant application includes "all know principles of ceramic science", or that once a person of skill in the art knows of a specific type of composition which is superconducting at greater than or equal to 26K, such a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions.

Thus the Examiner's own statement is that applicants have provided sufficient guidance to enable others to practice their claimed invention and therefore, applicants claims are enabled. The Board in Ex parte Jackson 217 USPQ 804 and 807 states "a considerable amount of experimentation is permissible if it is merely routine." As stated by the Examiner the experimentation to find other species is merely routine. The Board in Ex parte Jackson goes on to state if the experimentation is not merely routine there is enablement "if the specification in question provides excessable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to produce a desired embodiment of the invention claimed." 217 USPQ 804, 807. Thus guidance is needed when the experimentation is not merely routine. Since there is no evidence in the present application that anything other that routine experimentation is needed to determine other species, than specifically described by Applicants', the guidance provided by Applicants' teaching is sufficient to satisfy enablement.

In applicants' SECOND SUPPLEMENTAL AMENDMENT submitted March 8, 2005 applicants state in the paragraph bridging pages 153 and 154:

> Charles Poole et al. published another book in 1995 entitled "Superconductivity" Academic Press which has a Chapter 7 on "Perovskite and Cuprate Crystallographic Structures". (See Attachment Z). This book will be referred to as Poole 1995.
>
> At page 179 of Poole 1995 states:

V. PEROVSKITE-TYPE SUPERCONDUCTING STRUCTURES

In their first report on high-temperature superconductors Bednorz and Muller (1986) referred to their samples as "metallic, oxygen-deficient ... perovskite-like mixed-valence copper compounds." Subsequent work has confirmed that the new superconductors do indeed possess these characteristics.

Thus Poole 1988 states that the high T_c superconducting materials "are not difficult to synthesize" and Poole 1995 states that "the new superconductors do indeed possess [the] characteristics" that Applicants' specification describes these new superconductors to have.

The following claims recite that the high Tc element of the claims from which these claims depend "can be made according to known principles of ceramic science" or similar recitation: claims 322 to 360, 414 to 427, 436, 453 to 465, 473 to 475, 484 to 491 and 522. Of these claims the following are allowed: 330, 335, 336, 346 and 358. Poole 1988 states that the high T_c superconducting materials "are not difficult to synthesize"

Claim 517 recites

said superconductive current carrying element comprises a metallic, oxygen-deficient, perovskite-like, mixed valent copper compound.

Claim 537 recites

a metallic, oxygen-deficient, perovskite-like, mixed valent transition metal composition exhibiting a superconductive state at a temperature greater than or equal to 26°K,

Poole 1995 states that "the new superconductors do indeed possess [the] characteristics" explicitly recited in claims 517 and 537 that Applicants' specification describes these new superconductors to have.

Poole 1995 is Brief Attachment Z and Poole 1988 is Brief Attachment AW. Poole 1995 and Poole 1998 corroborate the truth of Applicants' teaching.
It is thus clear from the unrebutted objective evidence that Applicants' teaching has provided sufficient guidance for persons of skill in the art to practice Applicant's claimed invention outside the scope of the allowed claims. The Poole 1995 book confirms that the guidance given by Applicants in their publication incorporated in the teaching of the present application was accurate, as subsequent work has shown. Thus applicants claims are fully enabled and the rejections for lack of enablement should be reversed. As noted above in the Schuller article cited by the Examiner, systematic searches using well-defined empirical strategies "in the oxides gave rise to many superconducting systems." Thus persons or ordinary skill in the art guided by Applicants' teaching and with the knowledge of a person of ordinary skill in the art known prior to their discovery using well-defined empirical strategies gave rise to other species within the scope of applicants claims thereby establishing that Applicants' teaching is fully enabling and the rejections for lack of enhancement should be reversed. As noted below the Schuller article states similar systematic studies, i.e. what a person of skill in the art does, following the discovery of superconductivity in M_gB_2 has not uncovered new species. This is not evidence of lack of enablement since Schuller states these other species were made but when tested were not superconductors. Just as enablement does not require an applicant to "foresee" all species that come within the scope of the applicant's claim, it does not require an applicant to "foresee" species that do not come within the scope of the claim. All that is necessary is that they can be made without undue experimentation and tested to determine if such species has the properties to come within the scope of the claim.

Part VIII Section 2

Main Argument

CLAIM OF PRIORITY TO PRIORITY DOCUMENT

Applicants' claim of priority is identified in Part VIII, Section 1, Subsection A

Preliminary Comment

The Final Action does not refer to Applicants' claim of priority. The Examiner states at page 3 of OA 07/28/2004 which is incorporated into the Final Action:

> Accordingly, the issue of the instant claims being supported by the priority document is believed moot in view of the withdrawal of the prior art rejections.

Applicants disagree that the "issue of the instant claims being supported by the priority document is ... moot in view of the withdrawal of the prior art rejections." Whether the claims are supported by the priority document is not dependent of whether there are prior art rejections. For the reasons given below it is Applicants' view that all their claims are supported by the priority document and request that priority be granted to the priority document. Applicants disagree that the issue of the instant claims being supported by the priority document is moot. As stated in the Summary of this Argument it is not necessary to decide the issue of Applicants' claim of priority to the priority document to decide the issues of this appeal. Therefore, Applicants request the Board to either decide the issue of the claim of priority or to formally enter into the record a statement that the issue of the claim of priority is not decided. This will leave the record clear that Applicants have not conceded to the Examiner's objection to applicants claim of priority which will be available to Applicants' for decision, if needed, at a future date.

Detailed Argument to Support the Claim of Priority

At page 2 of the Office Action dated July 30, 1998 (referred to herein as OA 07/30/1998) the Examiner has acknowledged Applicants' claim for priority under 35 USC §119 in the parent application, Serial No. 08/053,307 filed April 23, 1993. The certified copy of the priority document has been filed in parent application, Serial No. 08/053,307, filed on April 23, 1993 as paper no. 28. (References to the priority document herein are to the corresponding European Patent Application 275 343 A1 published on July 27, 1988. This is Brief Attachment AE which is Attachment 1 to Applicants' Response Dated 03/14/2004 submitted in Response to Office Action dated 07/28/2004 entitled "Third Supplementary Amendment"]

The argument below was presented in Applicants' Response dated 08/02/1999 in Response to Office Action dated 07/30/1998, entitled "Supplementary Amendment". The Examiner has not responded to this argument in support of priority.

Applicants respectfully disagree with the Examiner that support is not found in that the priority document. The Examiner has made no attempt to rebut this based on what is taught in the priority document as it would be understood by a person of ordinary skill in the art. A person of ordinary skill in the art would recognize, from the priority document, that Applicants' were in possession of the invention as claimed in all of Applicants' claims. (A person of ordinary skill in the art is defined in the DST AFFIDAVITS Brief Attachments AM, AN and AO ¶'s 10 and 11. Since the Examiner has not commented on this definition, it is Applicants' understanding that the Examiner agrees with this definition.)

In this regard in OA 07/30/1998 at page 3 the Examiner states:

> Applicants' arguments filed May 14, 1998 (paper no. 19), May 1, 1998 (paper no. 18.5) and December 2, 1997 (paper no. 16) as well as the Affidavits and Attachments, have been fully considered but they are not deemed to be persuasive. The applicants quote some passages out of the priority document and argue that the present

> claims are fully based on that document. Nevertheless, that priority document is not deemed to provide basis for the limitations found in the present claims.

In this passage the Examiner states that "Applicants' arguments ... are not **deemed** to be persuasive" and "[n]evertheless, that priority document is not **deemed** to provide basis for the limitations found in the present claims." Webster's Ninth New Collegiate Dictionary (Merriam-Webster Inc., Springfield, Mass. 1987) defines "deem" as a transitive verb meaning "to come to think or judge" and as an intransitive verb meaning "to have an opinion : believe." The Examiner has used the intransitive form of the verb "deemed." The Examiner has cited no statutory or case law authority which permits an Examiner to object to a claim of priority based on the Examiner's "opinion" or "belief" that a priority document does not support Applicants' claims. The Examiner must support a denial of a claim of priority based on what is actually stated in the priority document. The Examiner has not done this. Thus the Examiner has not made a prima facia showing that the priority document does not support Applicants' claims.

The Examiner further states in support of the Examiner's "opinion" or "belief" at page 3, of O.A. 07/30/1998.

> I. The recitation of a "composition including a rare earth or rare earth-like element, an alkaline earth element, a transition metal element capable of exhibiting multivalent states, and oxygen", as found in claim 1 (lines 2-4). The certified priority document may provide basis for the formula $RE_2TM.O_4$ at p. 2, para. 4, but the claimed composition is deemed to be much broader than that formula.

Applicants respectfully disagree. In the priority document, (Brief Attachment AE) for example in the abstract, RE is a rare earth element, TM is a transition metal and O is oxygen. The priority document (Attachment AE)

further states at Col. 2, lines 22-25 "the lanthanum which belongs to the IIB group of elements is in part substituted by one member of the neighboring IIA group of elements...". Group IIA elements are the alkaline earth elements. The present specification teaches at page 11, lines 22-23, that RE stands for the rare earths (lanthanides) or rare earth-like elements. The "rare earth like element" act like a rare earth element in the superconductive composition. Thus a rare earth-like element is an equivalent of rare earth element. Similar language appears in the present specification at page 12 lines 6-8, "the lanthanum which belongs to the IIB group of elements is in part substituted by one member of the neighboring IIA group of elements...". Group IIB elements are included in the rare-earth elements. Therefore, the priority document teaches a composition including a transition metal, a rare earth or rare earth-like element, and alkaline earth. Applicants note that in the passage quoted above, the Examiner incorrectly states that Applicants claim a composition. This is not correct. Applicants claim an apparatus or device for flowing a superconducting current in a material, such as a ceramic material such as an oxide, such as a transition metal oxide. (This characterization is exemplary only and not intended to limit the scope of any claim.) In the last sentence of the passage quoted above the Examiner incorrectly states "the claimed composition is **deemed** to be much broader than [the] formula" $RE_2TM.O_4$" (Emphasis added). The priority document is not limited to his formula. The composition taught by the priority document have variable amounts of oxygen, rare earth, rare earth-like and alkaline earth elements as is clearly shown in the abstract of the priority document.

The Examiner further states in OA 07/30/1998 at page 3:

ii. The limitation "non-stoichiometfic amount of oxygen", as found in claims 84 (lines 2 and 3) and 86 (line 6). Basis may be seen for an oxygen deficit at p. 2, para. 4, but no such basis is seen for the more general limitation of "a nonstoichiometric amount of oxygen".

Applicants respectfully disagree. At Col. 3, lines 46-50 the priority document refers to applicants publication in Z. Phys. B - Condensed Matter 64 (1986) 189-193 (Brief Attachment AX) which is incorporated by reference in the present specification at page 6, lines 7-10. (This article is referred to here in as Applicants' article.) This article states at page 190, left col., lines 13-14 "[t]his system exhibits a number of oxygen-deficient phases with mixed-valent copper constituents." The priority document has various general formulas such as at Col. 3, lines 40, "$La_{2-x}Ba_xCuO_{4-y}$ $x<<1$ and $y\geq0$." The abstract has a more generic formula. A stoichiometric compound has a fixed amount of each element that make up the compound. Since, the amount of oxygen is variable, the formula has nonstoichiometric amounts of oxygen. Therefore, the priority document teaches nonstoichiometric amounts or oxygen.

In Brief Attachment AS there are copies of pages 224 and 225 of "Inorganic Chemistry" by Moeler, John Wiley & Sons, Inc. 1952 and a copy of page 70 of "Fundamentals of Chemistry, A Modern Introduction" by Brescia et al. , Academic Press, 1966. Brief Attachment AS provides an explanation of the terms stoichiometric and nonstoichiometric. The documents in Brief Attachment AS support applicants position that the priority document teaches nonstochiometric amounts or oxygen. Page 224 of the Moeler book states under the heading "Non-Stoichiometric Compounds)" that "the law of definite proportions is one of the basic tenets of chemistry. ...there are many instances, however, many instances of apparent departure of this rule among solid compounds." Page 70 of the Brecia et al., book defines the law of definite proportions in Section 4.2. "Such compounds do not possess the exact compositions which are predicted from electronic considerations alone and are commonly referred to as Berthollide or <u>non-stoichimetric</u>." (Emphasis Added) Thus persons of skill in the art long before Applicants' discovery understood the term "non-stoichimetric" and thus there is support for this term in the priority document.

The Examiner further states:

> iii. The limitation "a transition metal oxide having a phase therein which exhibits a superconductive state" is found in present claim 24, (line 2). The certified priority document may provide basis for compositions of the formula $RE_2TM.O_4$, as discussed above, but "transition metal oxide" and "superconductive state" are deemed to be much broader than the formula $RE_2TM.O_4$.

Applicants respectfully disagree. The field of the invention of the priority document (Brief Attachment AF) is "a new class of superconductors in particular components ..." and the title is "New Superconductive Compounds ...". Applicants' article (Brief Attachment AX) which is referred to in the priority document states at page 190, left Col., lines 14-16 from the bottom "X-ray powder diffractograms ... revealed three individual crystallographic phases." In the conclusion at page 192 the article states "[t]he system consists of three phases, one of them having a metallic perovskite-type layer-like structure. The characterization of the new, apparently superconducting, phase is in progress." Thus the priority document supports the limitation "a composition exhibiting a superconductive state". The general formula $RE_{2-x}AE_xTM.O_{4-y}$ $x<0.3$ $0.1\leq y \leq 0.5$ and the more specific formula $RE_2TM.O_4$ of the priority document is a composition; is a metal oxide; and is a transition metal oxide as recited in claim 24. As noted above, the Examiner incorrectly implies that the priority document is limited to compounds having the formula $RE_2TM.O_4$.

The Examiner further states at page 3 of OA 07/30/1998:

> iv. The limitation "a copper-oxide compound" is recited in claim 96 (line 4). The certified priority document may provide basis for compositions of the formula $RE_2TM.O_4$, as discussed above, but "a copper-oxide compound" is not deemed to be equivalent to a composition of the formula $RE_2TM.O_4$. Basis is not seen in the certified priority document for "a copper oxide compound" with the breadth of the present claims.

Applicants respectfully disagree. Initially the Examiner incorrectly implies claim 96 is directed to a copper oxide compound. Claim 96 is directed to a an

apparatus comprising "copper oxide composition consisting essentially of a copper oxide compound having a layer-type perovskite-like structure." Applicants respectfully disagree with the Examiner's statement above. The priority document (Brief Attachment AE) recites numerous copper oxide compositions. It is noted that the Abstract of the priority document refers to "[t]he superconductive compounds are oxides of the general formula $RE_{2-x}AE_xTM.O_{4-y}$, wherein RE is a rare earth, AE is a member of the group of alkaline earths or a combination of at least two members of that group, and TM is a transition metal, and wherein $x < 0.3$ and $0.1 \leq y \leq 0.5$." This formula permits no alkaline earth and a varying amount of alkaline earth, rare earths and a varying amount of oxygen. At column 3, lines 20 and 35, there is recited "the Ba-La-Cu-O system" and at line 41 "$La_{2-x}Ba_xCuO_{4-y}x < 1$ and $y \leq 0$ and at line 44 teaches $La_{1-x}Va_xCuO_{3-y}$. Thus the priority document provides support for a composition including a transition metal, a rare earth or rare earth-like elements, an alkaline earth element, an oxygen as found in Applicants' claims, specifically claim 86. It is noted that at column 2, lines 13-19 the priority document states that "it is a characteristic of the present invention that in the compounds in question that the RE portion is partially substituted by one member of the alkaline earth group of metals, or by a combination of the members of this alkaline earth group and that the oxygen content is at a deficit." It is further noted that at column 2, lines 20-23 it states that "for example, one such compound that meets the description given by this lanthanum copper oxide La_2CuO_4 in which the lanthanum which belongs to the IIIB group of the elements is in part substituted by one member of the neighboring IIIA group of elements."

The priority document (Brief Attachment AE) at column 3, line 6 recites Ti as a transition metal. It is noted that in claim 1 of the priority document, claim 1 recites the structure $RE_{2-x}AE_xTM.O_{4-y}$ wherein TM is a transition metal. Claim 2 therein recites copper as the transition metal. Claim 3 therein recites nickel as the transition metal. Claim 8 therein recites chromium as the transition metal.

Consequently, a broader class of transition metals other than copper is supported by the priority document.

It is clear from the quoted sections of the priority document (Brief Attachment AE) that the priority document clearly supports a much broader composition than the Examiner is claiming that it does, and that the priority document, in fact, does support applicant's claims and that a person of skill in the art would recognize that Applicant was in possession of the invention as claimed in all of Applicants' claims from the teaching of the priority document.

As noted above, the general formula of the priority document is much broader than the formula $RE_2TM.O_4$ to which the Examiner incorrectly states the priority document is limited. The quantity of oxygen, the rare earth element and of an alkaline element is variable and the transition metal is not limited to copper. Consequently, the term "a copper-oxide compound" is adequately supported by the priority document (Brief Attachment AE).

The Examiner further states at page 3 of OA 07/30/1998:

> v. The limitation to the effect that "the copper oxide compound includes (including) at least one rare-earth or rare-earth-like element and at least one alkaline-earth element", as recited in claim 103 (lines 5 and 6). The certified priority document may provide basis for compositions of the formula $RE_2TM.0_4$, as discussed above, but basis is not seen for the more general limitation of "a copper-oxide compound" with a rare-earth (like) element and an alkaline earth element.

Applicants respectfully disagree. The second line of the abstract gives the general formula "$RE_{2-x}AE_xTM.O_{4-y}$ $x<<0.3$ and $0.1 \leq y \leq 0.5$." In claim 1 of the priority document $y \leq 0.5$. Claim 2 recites RE is lanthanum and TM is a copper. Claim 3 recites RE is cerium and TM is nickel. Claim 4 recites RE is lanthanum and TM is nickel. Claim 8 recites RE is lanthanum and TM is chromium. Claim 9 recites RE is neodymium and TM is copper. Applicants' claim 103 recites " the copper-oxide compound including at least one rare-earth or rare-earth-like

element and at least one alkaline-earth element". The priority document (Brief Attachment AE) clearly supports this recitation. Applicants, as stated above, respectfully submit the Examiner is misrepresenting the priority document (Brief Attachment AE) which refers throughout and, in particular, in the Abstract to "the general formula $RE_{2-x}AE_xEM.O_{4-y}$ as stated above which includes a copper-oxide as stated above. The Examiner further states in the passage quoted above "but basis is not seen for the more general limitation of 'a copper-oxide compound' with a rare-earth (like) element and in alkaline earth element." It is noted that in the priority document (Brief Attachment AE), claim 2 refers to lanthanum as the rare earth; claim 3 refers to cerium as the rare earth; claim 5 refers to barium as a partial substitute for the rare earth; claim 6 refers to calcium as a partial substitute for the rare earth; claim 7 refers to strontium as a partial substitute for the rare earth and claim 9 refers to neodymium as the rare earth. Clearly, the priority document uses barium, calcium and strontium. Consequently, the priority document supports the term rare earth-like since in includes elements (e.g. barium, calcium and strontium) other than those commonly referred to as the rare earth elements [which are elements 21, 39, 57-71 and 89, see DST AFFIDAVITS ¶ 23 Brief Attachments AM, AN and AO] which satisfy the teaching of the priority document and of the present application. The Abstract of the priority document refers to "AE as a member of the alkaline earth or a combination of at least two members of that group." Consequently, the priority document clearly supports an alkaline earth element.

The Examiner further states at page 4 of OA 07/30/1998:

> vi. The limitation as to "the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, as found in claim 103 (lines 13, 6 and 17). The critical temperature, T_c , is discussed throughout that certified priority document, but not $T\rho=0$.

Applicants respectfully disagree. $T_{\rho=0}$ is the temperature at which the bulk resistively is about zero. T_c is the critical temperature or the temperature above which superconductivity does not exist. The priority document (Brief Attachment

AE) refers to Applicants' article (Brief Attachment AX) of which Figures 1,2 and 3 are the same figures as Figures 2, 3 and 4 of the present application. At page 22, lines 19-24, the present specification refers to Figure 4 of the specification stating "[i]ts resistivety decreases by at least three orders of magnitude, giving evidence for the bulk being superconducting below 13 K with an onset around 35 K, as shown in FIG. 4 on an expanded scale." When a superconductor is totally superconductive the resistivety, ρ, is zero. The temperature at which this occurs is $T_{\rho=0}$. Applicants' article (Brief Attachment AX), (and thus the priority document (Brief Attachment AE)), at page 191, right column, in referring to Fig. 1 thereof states "[u]pon cooling from room temperature, the latter exhibit a nearly linear metallic decrease of ρ(T) then a logarithmic type of increase, before undergoing the transition to superconductivity." And in the sentence bridging pages 191-192 of applicants' article (Brief Attachment AX) "[t]herefore, under the above premises, the peak in ρ(T) at 35 K, observed ... has to be identified as the start to superconductive cooperative phenomena." And applicants' article at page 192, left column, states "[u]pon cooling below T_c ... the bulk resistively gradually drops to zero by three orders of magnitude, for sample 2 (Fig. 1)" From these statements in applicants article (which is referred to in the priority document) it is clear that the language objected to by the Examiner is supported in the priority document.

For the reason given above the priority document clearly supports the term "$T_{\rho=0}$". Although this particular symbol is not used in the priority document, the priority document clearly shows that as temperature is decreased the resistively of a superconductor begins to drop in the value at the critical temperature T_c and goes to zero at another temperature, that is $T_{\rho=0}$. This symbol is just a short hand notation for that temperature. This property of superconducting materials is well known prior to applicants filing date, in fact that is what is meant by the term superconductor which is a material for which ρ=0 for temperatures less than a certain temperature, i.e., $T_{\rho=0}$. It is also well-known that: "[i]n the ideal case the resistance vanishes completely and discontinuously

at a transition temperature. Ts ... Actually, the resistance temperature curve does fall more sharply the more the specimen is like a single crystal ... [T]he drop always occurs in a measurable temperature range ..." (Theory of Superconductivity, M. von Laue, Academic Press, Inc., 1952) (See Brief Attachment AD). Moreover, the priority document at column 1, the first sentence of the Background of the Invention states "[s]uperconductivity is usually defined as the complete loss of electrical resistance of a material at a well defined temperature". That temperature is symbolically represented as $T_{\rho=0}$.

Applicants respectfully disagree with the Examiner's position on Applicants' claim of priority. The field of the invention of the priority document (Brief Attachment AE) is "a new class of superconductors in particular components ..." and the title is "New Superconductive Compounds ...". Applicants' article (Brief Attachment AX) which is referred to in the priority document states at page 190, left Col., lines 14-16 from the bottom "X-ray powder diffractograms ... revealed three individual crystallographic phases." In the conclusion at page 192 applicants' article (Brief Attachment AX) states "[t]he system consists of three phases, one of them having a metallic perovskite-type layer-like structure. The characterization of the new, apparently superconducting, phase is in progress." Thus the priority document supports the limitation "a composition exhibiting a superconductive state". The general formula $RE_{2-x}AE_xTM.O_{4-y}$ $x<0.3$ $0.1 \le y \le 0.5$ and the more specific formula $RE_2TM.O_4$ of the priority document (Brief Attachment AE) is a composition, a ceramic, an oxide, a metal oxide and a transition metal oxide as recited in applicants' claims. As noted above, the Examiner incorrectly implies that the priority document is limited to compounds having the formula $RE_2TM.O_4$.

The Examiner has provided no rebuttal to Applicants' reasons for why a person of ordinary skill in the art would not recognize that Applicants' were in possession of the inventions of Applicants' claims on appeal from the teaching of Applicants' priority document. For this reason the Board should reverse the Examiner's denial of Applicants' claim of priority to the priority document (Brief

Attachment AE) or in the alternative Applicants request the Board to formally note in the record that Applicants' claim of priority will not be ruled on since Applicants' claim of priority does not have to be decided to resolve the issues of this appeal.

In view of the above argument Applicants request that the claim of priority to the priority document be granted.

Detailed Argument to Support the Enablement of the Applicants' Claims.

Claims 1-64, 66-72, 84, 85, 88-96, 100-102, 109-112, 115-122, 126-134, 139, 141-143, 146-149, 153-155, 162-166, 182-184, 187, 188, 192-195, 198-212, 217-219, 222, 223, 227-230, 232-234, 237-240, 244-246, 253-257, 268, 273-275, 278, 279, 283-286, 289-295, 302, 303, 308-310, 313, 314, 318-329, 331-334, 337-345, 347-357, 359-374, 376, 379, 380, 382, 383, 389, 394, 395, 402, 407, 408, 414-501, 508-510, 515-543 (Applicants believe that claims 379 and 380 should not be rejected but should be allowed for the same reasons that claims 77 and 80, respectively, are allowed) have been rejected under 35 U.S.C. 112, first paragraph. The Examiner states at page 4 of the Final Office Action that these claims have been rejected:

> "because the specification, while being enabling for compositions comprising a transition metal oxide containing at least a) an alkaline earth element or Group IIA element and b) a rare-earth element or Group IIIB element, does not reasonably provide enablement for the invention as claimed. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims."

Applicants disagree with this statement. Applicants note, as explained below, the evidence submitted by the Examiner, the Schuller article, disagrees with this statement.

The Examiner further states at page 4 of the Final Rejection "This rejection is maintained for the reasons set forth in the Rejection mailed 7/28/04 (pages 5-8). "The reasons for rejection in the Office Action dated 07/28/2004 (referred to herein as OA 07/28/2004) will be addressed sequentially as they occur herein.

The Examiner states the same thing at page 5 of Office Action dated 07/28/2004:

> Claims 1-64, 66-72, 84, 85, 88-96,100-102, 109-112, 115-122, 126-134, 139, 141-143, 146-149, 153-155, 162-166, 182-184, 187, 188, 192-195, 198-212, 217-219, 222, 223, 227-230, 232-234, 237-240, 244-246, 253-257, 268, 273-275, 278, 279, 283-286, 289-295, 302, 303, 308-310, 313, 314, 318-329, 331-334, 337-345, 347-357, 359-

> 374, 376, 379, 380, 382, 383, 389, 394, 395, 402, 407 and 408 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for compositions comprising a transition metal oxide containing at least a) an alkaline earth element or Group IIA element and b) a rare-earth element or Group IIIB element, does not reasonably provide enablement for the invention as claimed. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.

Applicants respectfully disagree. The claims are directed to an apparatus or structure. The claims are not directed to a composition of matter as implied by the Examiner's statement. The Examiner provides no reasons for why the specification does not enable an apparatus or structure comprising an element having at $T_c \geq 26^{\circ}K$ and conducting a superconductive current wherein the superconducting element is not limited to a transition metal oxide containing at least a) an alkaline earth element or Group IIA element and b) a rare earth element or Group IIIB element.

The Examiner further states at page 6 of Office Action dated 07/28/2004:

> The present specification is deemed to be enabled only for compositions comprising a transition metal oxide containing at least a) an alkaline earth element and b) a rare-earth element or Group IIIB element. The art of high temperature (above 30K) superconductors is an extremely unpredictable one. Small changes in composition can result in dramatic changes in or loss of superconducting properties. The amount and type of examples necessary to support broad claims increases as the predictability of the art decreases.[2] Claims broad enough to cover a large number of compositions that do not exhibit the desired properties fail to satisfy the requirements of 35 U.S.C. 112.[3] Merely reciting a desired result does not overcome this failure.[4] In particular, the question arises: will any layered perovskite material exhibit superconductivity?

The Examiner has repeated grounds for rejection that Applicants have rebutted in responses prior to OA 07/28/2004. The Examiner has not stated why Applicants' rebuttal does not overcome these grounds for rejection. Applicants

previously state reasons for why Applicants' claims were enabled are restated herein.

Initially, an art is unpredictable not because a skilled artisan does not know in advance what will have the desired properties, but is unpredictable when the method of making is not sufficiently understood so that it is unknown how to make species without undue experimentation - experimentation beyond that of the skilled artisan. This is independent of the presence or absence of a theory which does not provide knowledge of how to make and how to practice such species.

A large number of examples are needed to support a broad claim in an unpredictable art only if a person of skill in the art has to engage in undue experimentation to determine embodiments not specifically recited in Applicants' teachings that come within the scope of Applicants' claims. It is the Examiner's burden to show that undue experimentation is necessary. The Examiner has presented no extrinsic or intrinsic evidence that a person of skill in the art would have to engage in undue experimentation which is the Examiner's burden to show. The Examiner has stated without support that the art of high temperative superconductivity is an extremely unpredictable one. Thus the Examiner has not made a prima facie showing that the art of high Tc superconductivity is unpredictable. An art is unpredictable when species within the scope of the claim can not be determined without undue experimentation. Applicants disagree that the art of high T_c superconducting is "unpredictable" within the meaning of U.S. Patent law as will be explained below. As stated by the Examiner "[t]hat small changes in the composition can result in dramatic changes in or loss of superconducting properties" is not evidence of unpredictability. To the contrary, that compositions can be made and tested is evidence of enablement. As stated by the CAFC in Rexnord v. Laitram Supra enablement does not require forseeability. Applicants have not merely stated a desired result as clearly shown by the five affidavits submitted by five experts in the field (Mitzi, Tsuei, Dinger,

Duncombe and Shaw – Brief Attachments AH to AO), the Poole 1988 book (Brief Attachment AF and AW) the Poole 1995 book (Brief Attachment W), the Poole 1996 book (Brief Attachment AG) and the Rao article (Brief Attachment AB) and the list of known high T_c superconductors Brief Attachment AC. And it is not necessary for any layered perovskite to work to satisfy 35 USC 112, first paragraph. It is only necessary that they can be determined without undue experimentation. Moreover, Applicants' claims include only those which work and exclude those which do not work.

The Examiner restate in OA 07/25/2004 without support that "It should be noted that at the time the invention was made, the theoretical mechanism of superconductivity in these materials was not well understood. That mechanism still is not understood." Applicants note that the basic theory of superconductivity has been understood for some time. For example, the book by Von Laue entitled "Superconductivity", published in English in 1952, presents a comprehensive theory of superconductivity. The entire text of this book is included in Brief Attachment AT. Notwithstanding, for a claim to be enabled under section 112, it does not require an understanding of the theory. The Examiner then conclusory states "Accordingly, there appears to be little factual or theoretical basis for extending the scope of the claims much beyond the proportions and materials actually demonstrated to exhibit high temperature superconductivity". This statement is clearly inconsistent with In re Angstadt 190 USPQ 219 and In re Wands 8 USPQ2d 1400 (both discussed below) which held that to satisfy the first paragraph of 35 USC 112 it is only necessary that a person of skill in the art not exercise undue experimentation to make samples that come within the scope of the Applicants' claims. These decisions do not require that theory of the claimed invention be well understood for an Applicant's claims to be enabled. The Examiner cites on authority to support the Examiner's position. Throughout the prosecution of the present application and the Ancestral Applications Applicants have clearly shown that only routine experimentation is needed to

fabricate samples to practice Applicants' claimed invention. This will be reviewed below. The Examiner has not denied, nor rebutted this.

The Examiner provides no factual evidence to support the statement "[t]he art of high temperature (above 30 K) superconductors is an extremely unpredictable one." This is an opinion of the Examiner. As shown herein the basic theory of Superconductivity has been known since at least 1952 as indicated in the book by von Laue "Theory of Superconductivity" (Brief Attachment AT). The Board should reverse the rejection. It is Applicants' teaching that controlling the amount of the constituents of the composition, such as oxygen content, effect the superconductive properties of the composition. It is a matter of routine experimentation to find the optimum constituents, such as oxygen content, for a particular high T_c superconducting composition. Applicants do not have to provide experimental results for every composition that fall within the scope of their claims when a person of skill in the art exercising routine experimentation has a reasonable expectation of success following Applicants' teaching to achieve a composition through which can be flowed a superconducting current according to the teaching of Applicants' specification. The Examiner cites no authority stating that empirical searching for species within the scope of Applicants' claims fails the enablement requirement.

At page 6 of the Office Action dated 07/28/2004 the Examiner refers to In re Angstadt. According to In re Angstadt 190 USPQ 214, 218 in an unpredictable art, §112 does not require disclosure of a test with every species covered by a claim. The CCPA states:

> To require such a complete disclosure would apparently necessitate a patent application or applications with "thousands" of examples or the disclosure of "thousands" of catalysts along with information as to whether each exhibits catalytic behavior resulting in the production of hydroperoxides. More importantly, such a requirement would force an inventor seeking adequate patent protection to carry out a prohibitive number of actual experiments.

This would tend to discourage inventors from filing patent applications in an unpredictable area since the patent claims would have to be limited to those embodiments which are expressly disclosed. A potential infringer could readily avoid "literal" infringement of such claims by merely finding another analogous catalyst complex which could be used in "forming hydroperoxides." (Emphasis Added)

The Examiner provides no evidence or argument to support the application, to the present invention, of the Examiner's statement that "[t]he amount and type of examples necessary to support broad claims increases as the predictability of the art decreases to applicants' rejected claims." The Examiner has provided no argument or evidence that the predictability within the meaning of the U.S. patent law, of art of high T_c superconductivity is low. The Examiner's statement that "[c]laims broad enough to cover a large number of compositions that do not exhibit the desired properties fail to satisfy the requirements of 35 USC 112." implies that Applicants' claims "cover a large number of compositions that do not exhibit the desired properties" of high T_c superconductors. The Examiner has provided no argument or evidence to support the Examiner's implication. In fact, the claims do not cover any compositions that do not exhibit the desired properties of high T_c superconductors. Applicants' claims only cover apparatus or structures comprising superconductors having $T_c \geq 26^{\circ}K$ which carry a superconductive current. Applicants' claims are not composition of matter claims. Under In re. Angstadt Supra, a patent application is not limited to claims covering embodiments expressly disclosed in their specification.

The Board's attention is directed to the following comments from the specification at page 1, lines 5-10:

> "This invention relates to ... superconducting compositions including copper and/or transition metals."

The specification further states at page 5, lines 2-9 that:

It is another object of the present invention to provide novel superconductive materials that are multi-valent oxides including transition metals, the compositions having a perovskite-like structure.

It is a further object of the present invention to provide novel superconductive compositions that are oxides including rare earth and/or rare earth-like atoms, together with copper or other transition metals that can exhibit mixed valent behavior.

The title of the application is directed to super-conductive compositions.

The specification further states at page 8, lines 1-11, that "[A]n example of a superconductive composition having high T_c is the composition represented by the formula RE-TM-O, where RE is a rare earth or rare earth-like element, TM is a nonmagnetic transition metal, and O is oxygen. Examples of transition metal elements include Cu, Ni, Cr etc. In particular, transition metals that can exhibit multi-valent states are very suitable. The rare earth elements are typically elements 58-71 of the periodic table, including Ce, Nd, etc. If an alkaline earth element (AE) were also present, the composition would be represented by the general formula RE-AE-TM-O."

And at page 7, lines 14-15, the specification states that "the rare earths site can also include alkaline earth elements."

The specification further states at page 11, lines 19-24, that "An example of a superconductive compound having a layer-type structure in accordance with the present invention is an oxide of the general composition RE_2TMO_4, where RE stands for the rare earths (lanthanides) or rare earth-like elements and TM stands for a transition metal."

The composition RE_2TMO_4:RE is referred to at page 24, lines 5-9; $RE_{2-x}TM_xO_{4-y}$ is referred to at page 25, lines 19-21.

The following specific compounds are recited in the application:

$Ba_4La_{5-x}Cu_5O_{5(3-y)}$ at page 10, lines 4, 10, 14.
$La_{2-x}Ba_xCuO_{4-y}$ at page 12, line 13
$La_{2-x}Ba_xNiO_{4-y}$ at page 12, line 13
$La_{2-x}Sn_xNiO_{4-y}$ at page 12, line 17
$Ce_{2-x}Cu_xNiO_{4-y}$ at page 12, line 19
La_2CuO_4 at page 12, line 21
La_2CuO_{4-y} with Sr^{2x}, Ba^{2x} and Ca^{2x} substitution at page 13, line 17
$La_{2-x}Sn_xCuO_{4-y}$ at page 17, line 21
$La_{2-x}Ca_xCuO_{4-y}$ at page 17, line 21
$La_{2-x}Ba_xCuO_{4-y}$ at page 18, line 6
La_2CuO_4 :Ba at page 18, line 15
La_2CuO_4 :Ba at page 24, line 6
Nd_2NiO_4 :Sn at page 24, line 9
La_2CuO_{4-y} doped with Sn^{2x}, Ca^{2x} and Ba^{2x} at page 25, lines 6-18

Other compounds are given in the articles to B. Raveau, in Mat. Res. Bull., Vol. 20 (1985) pp. 667-671 (Brief Attachment G) , and to C. Michel et al. in Rev. Claim. Min. 21 (1984) 407 (Brief Attachment H) , both of which are incorporated by reference at page 13, lines 4-5 of the specification.

These descriptions cited in Applicant's specification are examples of the general and specific mature of Applicant's teaching to support the enablement of their claims.

In the footnote at page 6 of the Office Action dated 07/28/2004 the Examiner cites In re Fisher, 166 USPQ 18, In re Angstadt and Griffin, 150 USPO 214, and In re Colianni, 195 USPQ 150, in support of the statement "[t]he amount and type of examples necessary to support broad claims increases as the predictability of the art decreases". Applicant restates that the Examiner has not made a prima facie showing that the high Tc art is unpredictable.

The claims under appeal In re Fisher are directed to increasing the potency of substances containing ACTH hormones for injection into human beings. In regards to the rejection for insufficient disclosure under 35 USC 112 the CCPA states that:

"the issue thus presented is whether an inventor with the first to achieve potency of greater that 1.0 for certain types of compositions, which potency was long desired because of its beneficial effects on humans, should be allowed to dominate *all* compositions having potencies greater 1.0, thus including future compositions having potencies in excess of those obtainable from his teachings plus ordinary skill." 166 USPQ 18, 23-24 (emphasis in the original).

The Examiner has not shown that Applicants' claims include compositions "in excess of those obtainable from his teaching plus ordinary skill." Applicants documentary, declaration and affidavit evidence show that Applicants' claims do not include compositions "in excess of those obtainable from [Applicants'] teaching plus ordinary skill". Applicants' documentary, declaration and affidavit evidence has shown that example of high T_c materials not specifically identified in Applicants' specification can be determined or made with routine experimentation and thus those examples are predictable from Applicants' teaching. Theoretical predictability or forseeability is not required or a mental recognition of a specific example is not required. If an example is determined by routine experimentation it is within the scope of a claim under 35 USC 112.

The CCPA goes on to say in In re Fisher that:

"<u>It is apparent that such an inventor should be allowed to dominate the future patentable inventions of others where those inventions were based in some way on his teachings.</u> Such improvements, while unobvious from his teachings, are still within his contribution, since the improvement was made possible by his work. It is equally apparent, however, that he must not be committed to achieve this dominance by claims which are insufficiently supported and hence, not in compliance with the first paragraph of 35 USC 112. That paragraph requires that the scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification to persons of ordinary skills in the art... In cases involving unpredictable factors, such as most chemical reactions... the scope of enablement obviously varies inversely with the degree of unpredictability of the factors involved." (166 USPQ 18, 24) (Emphasis added)

Applicants of the present invention have provided the first teaching that compositions, for example such as ceramics and more particularly metal oxides and transition metal oxides, can form a superconductor having a critical temperature greater than or equal to 26ºK, therefore, it "is apparent that such an [applicant] should be allowed to dominate the future patentable inventions of others when those inventions [are] based in some way on [Applicants] teaching" as stated by the CCPA In re Fisher supra. All known high Tc superconductors are based on Applicants' teachings. The Examiner has acknowledged this by rejection of all claims over the Asahi Shinbum article under 35 USC 103 as described in detail below.

In the present invention, Applicants are acknowledged to be the pioneers of high T_c superconducting compositions, such as for example ceramic materials. The Examiner has produced no argument or evidence that inventions which come within the scope of Applicants' claim cannot be made by persons of skill in the art based on Applicants' teaching. The affidavits of Mitzi (Brief Attachment AH), Dinger (Brief Attachment AG), Tsuei (Brief Attachment AJ), Shaw (Brief Attachment AK), Duncombe (Brief Attachment AL) The DST AFFIDAVITS ¶ 23 Brief Attachments AM, AN and AO and the book of Poole 1988 book (Brief Attachment AF and AW) it is straight forward to use the general principles of ceramic science to make high T_c superconductors following Applicants' teaching.

APPLICABILITY OF IN RE FISHER

In In re Fisher 166 USPQ 18 two claims (4 and 5) were under appeal. Claim 4 was directed to "A method ... for producing ACTH [adrenocorticotrophic hormones] preparations having potencies ranging from 111% to 230% of standard and containing no more than 0.08 units of vasopressin and no more than 0.05 units of oxytocin per International Unit of ACTH, which limits are said to be tolerable to humans." 166 USPQ 18, 20. "The claim recites that the product must contain 'at least' 24 amino acids in a specified sequence." 166 USPQ 18, 21. To avoid a reference to Li, having a publication date prior to the filing date, the appellant relied on its parent application of which the application under appeal was a continuation-in-part. The CCPA states:

> Appellant's parent application, therefore, discloses no products, inherently or expressly, containing other than 39 amino acids, yet the claim includes all polypeptides, of the recited potency and purity, having at least 24 amino acids in the chain in the recited sequence. The parent specification does not enable one skilled in the art to make or obtain ACTH's with other than 39 amino acids in the chain, and there has been no showing that one of ordinary skill would have known how to make or obtain such other ACTH's without undue experimentation. As for appellant's conclusion that the 25th to 39th acids in the chain are unnecessary, it is one thing to make such a statement when persons skilled in the art are able to make or obtain ACTH having other than 39 amino acids; it is quite another thing when they are not able to do so. In the latter situation, the statement is in no way "enabling" and hence lends no further support for the broad claim. We conclude that appellant's parent application is insufficient to support a claim as broad as claim 4. For this reason we affirm the board's rejection of claim 4 as unpatentable over the Li references.

From this statement, it is clear that the reason for why the CCPA did not find the claims under appeal patentable was that the applicant did not teach how to make ACTH with anything but 39 amino acids and there was no evidence in the record that a person of skill in the art knew how to make ACTH with anything but 39 amino acids. It is also clear that if persons of skill in the art knew how to make

ACTH with more or less than 39 amino acids, the claims would not have been found not enabled.

In regard to the rejection of Fisher claims 4 and 5 for lack of enablement the CCPA states:

> We have already discussed, with respect to the parent application, the lack of teaching of how to obtain other-than-39 amino acid ACTHs. That discussion is fully applicable to the instant application, and we think the board was correct in finding insufficient disclosure due to this broad aspect of the claims. 166 USPQ 18, 23.

Thus the claims in Fisher were found not enabled because the Fisher application did not teach how to make "other-than-39 amino acid ACTHs" and there was no evidence in the record that persons of skill in the art knew how to make "other-than 39 amino acid ACTHs."

In regards to the rejection for enablement, the CCPA further states:

> The issue thus presented is whether an inventor who is the first to achieve a potency of greater than 1.0 for certain types of compositions, which potency was long desired because of its beneficial effect on humans, should be allowed to dominate all such compositions having potencies greater than 1.0, including future compositions having potencies far in excess of those obtainable from his teachings plus ordinary skill. 166 USPQ 18, 23.

Thus the CCPA rhetorically asks the question whether the first person to discover a composition having a potency greater than 1 where such potency is of significant value should be allowed a claim "including future compositions having potencies far in excess of those obtainable from his teachings plus ordinary skill."

The CCPA answers this rhetorical question stating:

> It is apparent that such an inventor should be allowed to dominate the future patentable inventions of others where those inventions were based in some way on his teachings. 166 USPQ 18,24

From this statement is clear that applicants such as the Applicants of the present invention "should be allowed to dominate the future patentable inventions of others where those inventions were based in some way on his teachings." In the present application it is undisputed that the high Tc materials discovered by others after Applicants' discovery "were based in some way on [Applicants'] teachings."

The CCPA further states in In re Fisher in regards to later inventions of other:

> Such improvements, while unobvious from his teachings, are still within his contribution, since the improvement was made possible by his work. 166 USPQ 12, 24

Thus in the present application "while [the high Tc materials discovered by others after Applicants' discovery may be] unobvious form [Applicants'] teachings, [they] are still within [Applicants'] contribution, since the improvement was made possible by [Applicants'] work." Applicants respectfully submit that the Examiner agrees with this when the Examiner states at page 8 of the Final Action:

> Such is the basis of applicant's invention. The examiner does not deny that the instant application includes "all know principles of ceramic science", or that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to *26K,* such a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions. (Emphasis in the original.)

The Examiner states here the that "The examiner does not deny ... that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to *26K,* such a person of skill in the art, using the techniques described in the application, ... can make the known superconductive compositions." (Emphasis in the original.) Thus Applicants respectfully submit that it is the Examiner's finding of fact that the "known superconductive compositions" are " based in some way on [applicants']

teachings" and thus under In re Fisher Applicants "should be allowed to dominate the future patentable inventions of others."

At page 8 of the Final Action the Examiner further states:

> The numerous 1.132 declarations, such as those of Mitzi, Shaw, Dinger and Duncombe, and the Rao article, are directed to production of know superconductive materials.

The Affidavits of Mitzi, Shaw, Dinger and Duncombe (Brief Attachments AH, AI, AJ, AK and the Affidavit of Shaw dated April 14, 2005, the Affidavit of Dinger dated April 4, 2005 and the Affidavit of Tsuei dated April 4, 2005 (the last three affidavits are referred to herein as the DST AFFIDAVITS Brief Attachments AM, AN and AO)) state:

> Once a person of skill in the art knows of a specific type of composition described in the Bednorz-Mueller application which is superconducting at greater than or equal to 26°K, such a person of skill in the art, using the techniques described in the Bednorz-Mueller application, which includes all principles of ceramic fabrication known at the time the application was initially filed, can make the compositions encompassed by the claims of the Bednorz-Mueller application, without undue experimentation or without requiring ingenuity beyond that expected of a person of skill in the art of the fabrication of ceramic materials. This is why the work of Bednorz and Mueller was reproduced so quickly after their discovery and why so much additional work was done in this field within a short period after their discovery. (See paragraph 8 of the DST Affidavits.)

Thus the Examiner agrees with Applicants' affiants.

The Examiner further states at page 9 of the Final Action:

> What is not a "matter of routine experimentation" in this complex, unpredictable art is arriving at superconductive compositions outside the scope of the allowable claims (e.g., subsequently discovered BSCCO or Tl-systems as disclosed in Rao (see response filed 3/8/05, pages 141-143).

Applicants respectfully disagree. Applicants believe that this statement is inconsistent with the Examiner's earlier statement above "that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at

greater than or equal to *26K,* such a person of skill in the art, using the techniques described in the application, ... can make the known superconductive compositions." (Emphasis in the original.) Applicants respectfully submit that this statement of the Examiner is stating that within the meaning of the US patent law the art of high Tc material is predictable. Additional support for this view is below. Applicants believe what the Examiner is really saying is:

> What is not ..."[obvious]" in this complex, [predictable] art is arriving at superconductive compositions outside the scope of the allowable claims (e.g., subsequently discovered BSCCO or Tl-systems as disclosed in Rao ....

However In re Fisher permits "[s]uch improvements, [which] while unobvious from [Applicants'] teachings, are still within [Applicants'] contribution, since the improvement was made possible by [Applicants'] work." Thus under In re Fisher Applicants are entitled to their generic claims even though later workers may have discovered unobvious species within the scope of Applicants' generic claims for which such later workers may be entitled to patent claims to such later discovered potentially unobvious species. That there may be potentially patentable unobvious species, not specifically identified by Applicants' teaching, does not mean, under In re Fisher, that Applicants have not fully enabled the genus that their claims cover. In re Fisher clearly permits an applicant to be allowed a generic claim covering species not explicitly taught that are not obvious patentable species within the scope of Applicants' claims.

Stated in another way, In re Fisher permits a first discoverer of an invention to be allowed a generic claim if the first discoverer teaches how to "make and use" species that come within the scope of the generic claim. To be allowed the generic claim In re Fisher does not require the first discoverer to specifically teach or to suggest every species that comes within the scope of the generic claim or to provide a theory which can be used to "theoretically predict" species that come within the scope of the generic claim. If In re Fisher required such specific teaching, suggestion or "theoretical predictability," then it would not

be possible, as In re Fisher states, "that such an inventor should be allowed to dominate the future patentable inventions of others where those inventions were based in some way on his teaching," because the future inventions of others would not be patentable since the earlier discoverer to be allowed the generic claim would have taught or suggested those future inventions or would have provided a theory to predict their existence and thus such future inventions would be anticipated or obvious in view of the earlier disclosure with the allowed genius claim. This is clearly not what In re Fisher stands for.

The Examiner further states at page 9 of the Final Action in regards to later discovered materials "[t]he examiner respectfully maintains that the instant disclosure has not provided sufficient guidance to produce such materials." Applicants respectfully submit that this statement is inconsistent with the Examiner's earlier statement above "that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to *26K,* such a person of skill in the art, using the techniques described in the application, ... can make the known superconductive compositions" (emphasis in the original.) In this statement the Examiner states that later discovered species are fabricated according to Applicants' teaching which means that Applicants' teaching has guidance on "how to make" the high Tc materials that come within the scope of Applicants' claims. Moreover, as described in detail in the prosecution of this application, the later discovered high Tc materials are consistent with the specific teaching of Applicants' original disclosure (see the DST AFFIDAVITS Brief Attachments AM, AN and AO). Thus Applicants' teaching has sufficient guidance to practice Applicants' claimed invention. Guidance is not predicting in advance what species will work, but is guidance on how to "make and use" the claimed invention as explicitly stated in 35 USC 112, paragraph one. As stated above, it is Applicants' understanding that the Examiner agrees that Applicants have taught how "to make and use" the claimed invention.

That a patent applicant can be allowed a claim that dominates the latter discovered patentable invention of others means that the claim allowed includes within its scope the patentable invention of the later discover. For the later discovered invention to be patentable over the teaching of the earlier disclosure means that the earlier disclosure cannot teach or suggest the later discovered invention. Thus, In re Fisher clearly acknowledges that the earlier applicant is entitled to a generic claim that includes within its scope that which it does not specifically teach nor suggest, but which it teaches how "to make and use" which is the only requirement of 35 USC 112, first paragraph. The earlier Applicant is entitled to the generic claim since that applicant is not required by 35 USC 112, first paragraph, to foresee all species that come within the scope of the generic claim. It is also a result of this rational that the lack of a theory, which can be used to foresee such species is not fatal to enablement so long as the earlier applicant has taught "how to make and use."

The Examiner further states at page 9 of the Final Action

> At page 125 of the response filed 1/31/05, applicant argues In re Fisher (166 USPQ 18] emphasizing "It is apparent that such an inventor should be allowed to dominate the future patentable inventions of others where those inventions were based in some way on his teachings". The examiner respectfully submits the remaining statements of Fisher are equally important:
>
>> It is equally apparent, however, that he must not be permitted to achieve this dominance by claims which are insufficiently supported and hence, not in compliance with the first paragraph of 35 USC 112. That paragraph requires the scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification to persons of ordinary skill in the art... In cases involving unpredictable factors such as most chemical reactions... the scope of enablement obviously varies inversely with the degree of unpredictability of the factors involved.

The Examiner's redacted quotation form In re Fisher excludes the underlined text below:

> It is equally apparent, however, that he must not be permitted to achieve this dominance by claims which are

insufficiently supported and hence not in compliance with the first paragraph of 35 USC 112. That paragraph requires that the scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification to persons of ordinary skill in the art.
In cases involving predictable factors, such as mechanical or electrical elements, a single embodiment provides broad enablement in the sense that, once imagined, other embodiments can be made without difficulty and their performance characteristics predicted by resort to known scientific laws. In cases involving unpredictable factors, such as most chemical reactions and physiological activity, the scope of enablement obviously varies inversely with the degree of unpredictability of the factors involved. 166 USPQ 18, 24 (CCPA 1970) (Emphasis added.)

This passage does not state that mechanical and electrical elements are per se predictable and that chemical reactions are per se unpredictable. As stated by Poole 1988 (Brief Attachments AF and AW) to make high Tc superconductors the chemical reactions do not have to be understood. Thus that part of the passage above "In cases involving unpredictable factors, such as most chemical reactions ... the scope of enablement obviously varies inversely with the degree of unpredictability of the factors involved" is not applicable to the claims of the present application. The first part of the underlined text states "In cases involving predictable factors, such as mechanical or electrical elements, a single embodiment provides broad enablement in the sense that, once imagined, other embodiments can be made without difficulty." In view of the Examiners statement at page 8 of the Final Action::

> The Examiner does not deny that the instant application includes "all know principles of ceramic science", or that once a person of skill in the art knows of a specific type of composition which is superconducting at greater than or equal to 26K, such a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions. (Emphasis in the original.)

the art of high Tc materials is not unpredictable since as stated by In re Fisher in a predictable art "a single embodiment provides broad enablement in the sense

that, once imagined, other embodiments can be made without difficulty." In the passage quoted from the Examiner above the Examiner states "that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to 26K, such a person of skill in the art, using the techniques described in the application... can make the known superconductive compositions" without difficulty. The underlined passage from In re Fisher quoted above further states "In cases involving predictable factors, ... other embodiments can be made without difficulty and their performance characteristics predicted by resort to known scientific laws." What is the meaning of "their performance characteristics predicted by resort to known scientific laws?" Does this language require a theory by the use of which "their performance characteristics [can be] predicted" or does "resort to known scientific laws" include within its meaning experimental testing? In In re Wands 858 F.2d 731, 742 (Fed. Cir. 1988); 8 U.S.P.Q.2D 1400, 1408 Judge Newman concurring in part, dissenting in part provides an answer by stating that "[The inventor] must provide sufficient data or authority to show that his results are reasonably predictable within the scope of the claimed generic invention, based on experiment and/or scientific theory. " Thus experiment or theory is sufficient to establish the "performance characteristics" referred to in In re Fisher and thereby predictability. The "performance characteristics" of the embodiments that can be made without difficulty according to the present application is whether that embodiment has a Tc greater than or equal to 26 K. A contrary result would not be logical. It would not be logical to state that a theory using theoretical calculations is permissible to establish predictability, but testing of an embodiment that can be made without difficulty is not sufficient to establish predictability. The Affidavit of Newns (Brief Attachment AP), discussed in detail below, compares the use of a theory in solid state science with experiment in solid state science. Dr. Newns refers to a theoretical computation in paragraphs 7 to 9 thereof as a "theoretical experiment." Dr. Newns states at paragraph 9 "Moreover, that a theoretical computation is a "theoretical experiment" is in the conceptual sense not different than a physical experiment." Applicants believe

that Judge Newman's comment above acknowledges the effective equivalence of theory and experimental testing in regards to the statement form In re Fisher that "their performance characteristics [can be] predicted by resort to known scientific laws." In regards to "embodiments [that] can be made without difficulty." Applicants believe that Judge Newman's comments means that experimental testing comes within the meaning of "resort to known scientific laws." Thus since the Examiner agrees that in view of Applicants' teaching other embodiments can be made without difficulty and since testing such embodiments for the presence of superconductivity is well know and routine, the art of high Tc superconductivity is predictable or determinable and thus enabled by Applicants' teaching.

As described in detail above it is clear that the reason for why the CCPA in In re Fisher did not find the claims under appeal patentable was that the applicant did not teach how to make ACTH with anything but 39 amino acids and there was no evidence in the record that a person of skill in the art knew haw to make ACTH with anything but 39 amino acids. The situation is different here. As stated above, it is Applicants' understanding that the Examiner's own finding of fact is that the "known superconductive compositions" are "based in some way on [applicants'] teachings." Moreover, the complex chemistry does not have to be understood to fabricate samples as stated in the book "Copper Oxide Superconductors" by Charles P. Poole, et al. (Poole 1988) (See ¶ 48 of DST AFFIDAVITS Brief Attachments AM, AN and AO) which states at page 59:

> [c]opper oxide superconductors with a purity sufficient to exhibit zero resistivity or to demonstrate levitation (Early) are not difficult to synthesize. We believe that this is at least partially responsible for the explosive worldwide growth in these materials.

Poole 1988 further states at page 61:

> [i]n this section three methods of preparation will be described, namely, the solid state, the coprecipitation, and the sol-gel techniques (Hatfi). The widely used solid-state technique permits off-the-shelf chemicals to be directly calcined into superconductors, and it requires little familiarity with the subtle physicochemical

> process involved in the transformation of a mixture of compounds into a superconductor.

Since skilled artisans can fabricate samples without knowing the "subtle physiochemical process involved" and without a detailed theory, this art is predictable. The statement from In re Fisher as quoted above that "[i] in cases involving unpredictable factors such as most chemical reactions" explicitly does not state that all chemical reactions are unpredictable. In fact, in the present invention, as stated by Poole 1988 quoted above, to make superconductors "requires little familiarity with the subtle physiochemical processes involved in the transformation of a mixture of compounds into a superconductor." This is one of the reasons for why Poole 1988 also states, as quoted above, that the superconductors "are not difficult to synthesis" and for why Poole 1988 also states as quoted above "that this is at least partially responsible for the explosive worldwide growth in these materials" shortly after Applicants' discovery. Thus the facts of the instant application are different from the fact of In re Fisher where the claims were found not enabled because, as stated above, the CCPA found that the applicant there did not teach how to make "other-than-39 amino acid ACTHs" and there was no evidence in the record that persons of skill in the art knew how to make "other-than 39 amino acid ACTHs." Consequently, the invention of In re Fisher may have been one of those "most chemical reactions" that involve unpredictable factors, but in contradistinction, the present invention is one of those chemically related applications that fall outside what the CCPA means by "most chemical reactions" since the present invention does not involve "unpredictable factors" since as stated by Poole 1988 the chemistry does not have to be understood to make the superconductors since the methods to make these superconductors are so well know. All that is needed is routine experimentation to fabricate samples. (See DST AFFIDAVITS Brief Attachments AM, AN and AO) There is no evidence to the contrary. Applicants respectfully submit that the Examiner has cited no evidence to the contrary and has presented no argument to the contrary. As stated above Applicants respectfully submit that the Examiner is viewing later discovered species that may be

nonobvious in view of Applicants' teaching as a reason to find Applicants generic claims as being not enabled. As described above, Applicants respectfully submit that such a view is inconsistent with In re Fisher which clearly permits a finding that a generic claim is enabled even though there may be later discovered nonobvious species within its scope. When an Examiner allows a species claim to a later applicant as a nonobvious species, with unexpectedly better results, in view of a prior art patent that claims a genus which includes the latter discovered species, the Examiner is not, by allowing the claim to the latter discovered species, rendering the earlier claimed genus invalid for the lack of the earlier disclosure enabling the latter discovered patentable species. It is routine practice for an Examiner to allow a later discovered species with unexpected results in view of an earlier prior art patent that claims a genus that include such species where the newly discovered species is made in the same way as taught in the earlier disclosure. See MPEP sections 16.02, 2144.08.

On the same day that the CCPA decided In re Fisher, the CCPA decided In re Irani 166 USPQ 24. The issue in In re Irani was whether claims directed to a crystalline anhydrous form of a compound, ATMP, was obvious in view of prior art to a glassy form a ATMP. The CCPA stated at 166 USPQ 24, 26

> we are not convinced that the references of record would lead one of ordinary skill in the art to expect that ATMP would exist in a crystalline, anhydrous form or, assuming such an expectation, that the references would render obvious a method by which such ATMP could be produced.

The CCPA further stated at 166 USPQ 24, 27

> As stated above, even assuming that one skilled in the art could have predicted with reasonable certainty that crystalline anhydrous ATMP could be produced, we are not convinced by this record that it would also have been obvious how this could be achieved. We note that neither the examiner nor the board has contended that a suitable process would have been obvious.

Thus it is clear from this quoted passage from In re Irani that

> [E]ven assuming that one skilled in the art could have [theoretically] predicted with reasonable certainty that [a compound] could be produced, we are not convinced by this record that it would also have been obvious how this could be achieved [that is, that there is how to "make and use" predictability of the compound.]

Consequently, it is clear that "theoretical predictability" is not synonymous with "how to make and use" predictability. 35 USC 112, first paragraph requires "how-to-make-and-use predictability," but not "theoretical predictability." (See the Affidavit of News submitted 04/12/2006 which discusses in detail theoretical predictability). Thus even if at the time of Applicants' discovery species of high Tc superconductors could not be "theoretically predicted," this does not mean that Applicants have not taught how to "make and use" their claimed invention. As noted above the Examiner's statement that "The examiner does not deny ... that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to *26K,* such a person of skill in the art, using the techniques described in the application, ... can make the known superconductive compositions" (Emphasis in the original.) acknowledges that Applicants have taught how to "make and use" their claimed invention. Thus the field of high Tc superconductivity is a predictable art subsequent to Applicants' discovery and based on Applicants' teaching.

The CAFC in In re Wright 27 USPQ2d 1510 (1993) supports Applicants' view that a predictable art is one in which species within the scope of a claim under examination are determinable whether or not a theory of the invention is known as of the filing date of the application under examination. The claims under examination in In re Wright are directed to a recombinant vaccine which confers immunity to chickens against a certain type of RNA tumor virus. These claims include in their scope vaccines against the AIDS virus. The CAFC states:

> Wright seeks allowance, however, of claims which would provide, in varying degrees, a much broader scope of protection than the allowed claims. 27 USPQ2d 150, 1511.

The CAFC further states:

> The Examiner made reference to the difficulty that the scientific community is having in developing generally successful AIDS virus vaccines merely to illustrate that the art was not even today as predictable as Wright suggested it was back in 1983!

No mention is made of the presence or absence of a theory. Thus In re Wright shows that an art is unpredictable when persons of skill in the art do not "know how to make" species that come within the scope of the claims and is predictable when people of skill in the art know how to make species within the scope of the claims based on the teaching of the application under examination. In contradistinction, as stated by Poole 1988, species within the scope of Applicants' claims are easy to make based on the knowledge of a person of skill in the art with Applicants' teaching as of Applicants' filing date and thus the high Tc art is predictable or determinable.

That some of the evidence that Applicants cite in support of their position that there claims are enabled, e.g., Poole 1988 (Brief Attachment AF and AW), Poole 1995 (Brief Attachment W), Poole 1996 (Brief Attachment AG), the Rao Article (Brief Attachment AB), and the Schuller Article Brief Attachment AZ), were published after Applicants filing dated does not exclude them from being used to support enablement as of Applicants' earliest filing date. In In re Hogan 559 F.2d 595, 605 194 USPQ 527. (1977) the CCPA states "[t]his court has approved use of later publications [e.g., after the filing date] as evidence of the state of the art existing on the filing date of the application."

The CCPA in In re Hogan 194 U.S.P.Q. (BNA) 527 states that the later state of the art is useable neither to establish enablement nor to establish lack or enablement, but is usable to establish what the state of the state of the art was at the time of filing of a patent application.

> A later state of the art is that state coming into existence after the filing date of an application. This

> court has approved use of later publications as evidence of the state of art existing on the filing date of an application. That approval does not extend, however, to the use of a later ... publication disclosing a later ... existing state of the art in testing an earlier ... application ... for compliance with § 112, first paragraph. The difference may be described as that between the permissible application of later knowledge about art-related facts existing on the filing date and the impermissible application of later knowledge about later art-related facts (here, amorphous polymers) which did not exist on the filing date. Thus, if appellants' 1953 application provided sufficient enablement, considering all available evidence (whenever that evidence became available) of the 1953 state of the art, i.e., of the condition of knowledge about all art-related facts existing in 1953, then the fact of that enablement was established for all time and a later change in the state of the art cannot change it.
> In re Hogan, 559 F.2d 595, 605 (C.C.P.A. 1977) 194 U.S.P.Q. (BNA) 527

That a claim presented for examination is found after filing to read on work that was developed after the filing date is not usable to establish non-enablement as of the filing date. The CCPA states that there is a remedy for a claim that once issued may literally include an embodiment that is not enabled by the teaching of the disclosure of the application containing the claim, that is the reverse doctrine of equivalents. In this regard the CCPA states:

> The PTO position, that claim 13 is of sufficient breadth to cover the later state of the art (amorphous polymers) shown in the "references," reflects a concern that allowance of claim 13 might lead to enforcement efforts against the later developers. Any such conjecture, if it exists, is both irrelevant and unwarranted. The business of the PTO is patentability, not infringement. Like the judicially-developed doctrine of equivalents, designed to protect the patentee with respect to later-developed variations of the claimed invention, the judicially-developed "reverse doctrine of equivalents," requiring interpretation of claims in light of the specification, may be safely relied upon to preclude improper enforcement

> against later developers. The courts have consistently considered subsequently existing states of the art as raising questions of infringement, but never of validity. It is, of course, a major and infinitely important function of the PTO to insure that those skilled in the art are enabled, as of the filing date, to practice the invention claimed. If, in the light of all proper evidence, the invention claimed be clearly enabled as of that date, the inquiry under § 112, first paragraph, is at an end.
> In re Hogan, 559 F.2d 595, 607 (C.C.P.A. 1977) 194 U.S.P.Q. (BNA) 527

It is clear from In re Hogan that "If, in the light of all proper evidence, the invention claimed be clearly enabled as of [the Applicants' earliest filing] date, the inquiry under § 112, first paragraph, is at an end." There is no evidence in this record that as of Applicants' discovery, Applicants' invention is not enabled.

The CAFC in In re Wright citing In re Hogan states:

> We note, however, that the issue is not what the state of the art is today or what a skilled artisan today would believe, but rather what the state of the art was [as of applicants' filing date] and what a skilled artisan would have believed at that time. Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir.), cert denied, 480 U.S. 947 (1987); In re Hogan, 559 F.2d 595, 604, 194 USPQ 527, 535 (CCPA 1977). Wright's tendency to employ the present tense often makes it difficult to determine whether Wright is asserting that certain information was known prior to February of 1983 or simply that that information is now known in the art.
> In re Wright, 999 F.2d 1557, 1563 (Fed. Cir. 1993), 27 USPQ1511, 1414 footnote 8.

There is no evidence in the record that a skilled artisan, once they became aware of Applicants' discovery, could not make other species that came within the scope of Applicants' claims with what was know to such artisans prior to Applicants' discovery. The DST AFFIDAVITS (Brief Attachments AM to AO) and affidavits of Brief Attachments AH to AL identify what was known to such artisans many years before Applicants' discovery that such artisans would use as of Applicants' discovery with Applicants' teaching to make such other species.

Applicants believe that the Examiner concurs in this when the Examiner states at page 8 of the Final Action:

> The Examiner does not deny that the instant application includes "all know principles of ceramic science", or that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to 26K, such a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions. The numerous 1.132 declarations, such as those of Mitzi, Shaw, Dinger and Duncombe, and the Rao article, are directed to production of know superconductive materials.
> (Emphasis in the original)

In In re Wands 858 F.2d 731, 742 (Fed. Cir. 1988); 8 U.S.P.Q.2D 1400 the CAFC stated in a concurring opinion "[The inventor] must provide sufficient data or authority to show that his results are reasonably predictable within the scope of the claimed generic invention, based on experiment and/or scientific theory. " Thus experiment or theory is sufficient to establish predictability. And as stated above by the Examiner "a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions." There is no requirement to know in advance all examples enabled by their teaching. Thus the field of High Tc superconductivity is predictable within the meaning of In re Wands.

The Examiner's reference to "subsequently discovered BSCCO or Tl-systems" suggests that it is the Examiner's view that for Applicants to be allowed a generic claim applicants must know in advance (foresee) all materials that can be used to practice Applicant's claims. The CAFC has stated in Sri Int'l v. Matsushita Elec. Corp., 775 F.2d 1107, 1121 (Fed. Cir. 1985); 227 USPQ 577, 586 that this is not necessary:

> The law does not require the impossible. Hence, it does not require that an applicant describe in his specification every conceivable and possible future embodiment of his invention. The law recognizes that patent specifications are written for those skilled in the art, and requires only that the inventor describe the "best mode" known at the time to him of making and using the invention. 35 U.S.C. § 112.

Applicants have shown that persons of ordinary skill in the art as of Applicants discovery can practice applicant's claims to their full scope and the Examiner has, in Applicants view as stated above, agreed with this. The DST AFFIDAVITS, as described in detail below, (Brief Attachments AM, AN and AO) describe in detail what persons of skill in the art knew prior to Applicants' discovery and how that knowledge together with Applicants' teaching lead others to discover other species within the scope of Applicants' claims.

The CAFC has further stated:

> An applicant for patent is required to disclose the best mode then known to him for practicing his invention. 35 U.S.C. § 112. He is not required to predict all future developments which enable the practice of his invention in substantially the same way. " Hughes Aircraft Co. v. United States, 717 F.2d 1351, 1362 (Fed. Cir. 1983);39 USPQ2d 1065.

This is exactly what applicants have done. Thus Applicant's claims are enabled.

The CAFC further states in regards to future developments:

> Enablement does not require the inventor to foresee every means of implementing an invention at pains of losing his patent franchise. Were it otherwise, claimed inventions would not include improved modes of practicing those inventions. Such narrow patent rights would rapidly become worthless as new modes of practicing the invention developed, and the inventor would lose the benefit of the patent bargain. Invitrogen Corp. v. Clontech Labs., Inc., 429 F.3d 1052, 1071 (Fed. Cir. 2005).

The Examiner's position in regards to the enablement of Applicants' claims is inconsistent with the CAFC's position that "Enablement does not require the inventor to foresee every means of implementing an invention." Thus Applicant's claims are enabled and Applicants respectfully request that the rejection for lack of enablement be withdrawn.

The Examiner in the Final Action dated 10/20/ 2005 at page 4 refers to a article by Schuller et al. which states in the passage from Schuller et al. quoted by the Examiner "[o]f course, 'enlightened' empirical searches either guided by chemical and materials intuition or systematic searches using well-defined strategies may prove to be fruitful. It is interesting to note that empirical searches in the oxides gave rise to many superconducting systems." See the Affidavit of Newns submitted 04/12/2006 ¶ 18. The DST AFFIDAVITS (Brief Attachments AM, AN and AO) describe what a person of skill in the art knew prior to Applicants' discovery upon which the systematic empirical study was based in view of Applicant's teaching. The Affidavit of News shows how this systematic empirical study is in principal the same as a systematic theoretical investigation

when a well developed theoretical formalism exists. Thus Applicant's claims are predictable within the meaning of 35 U.S.C. 112, first paragraph, and thus enabled. In the response submitted 01/28/2005 at pages 148-150 applicants applied the MPEP ¶ 2164.01(a) Undue Experimentation Factors from In re Wands. Applicants respectfully request the Examiner to review and reconsider this analysis in the Answer Brief.

The CCPA has stated in In re Marzzocchi 169 USPQ 367,369 (1971):

> the Patent and Trade-mark Office (PTO) bears the initial burden of providing reasons for doubting the objective truth of the statements made by appellants as to the scope of enablement. Only when the PTO meets this burden, does the burden shift to appellants to provide suitable evidence indicating that the specification is enabling in a manner commensurate in scope with the protection sought by the claims.

The only reasons given by the Examiner to "[doubt] the objective truth of the statements made by [Applicants] as to the scope of enablement" is that there is no theory for high Tc superconductivity and that Applicants describe examples that do not show high Tc properties. Since this does not make out a prima facie case of lack of enablement, the burden has not shifted to Applicants. As stated above, in Applicants' view, the CCPA and the CAFC, have stated that "theoretical predictability" and knowledge in advance of all species that come within the scope of genus claims is not required under 35 USC 112, first paragraph. All that 35 USC 112, first paragraph requires is "how-to-make-and-use predictability" which, as stated above, Applicants understand, from the Examiner's comments, that the Examiner agrees Applicants teaching provides.

In a presidential decision of the USPTO Board of Patent Appeals and Interferences, the Board states:

> The examiner notes that only a small group of species of the claimed genus have been prepared. However, the Examiner offers no reason why one skilled in the art could not "make"

> the claimed compounds. Ex parte Bhide 42 USPQ 1441, 1447.

Consequently, the Board agrees with the statement of the CCPA in In re Marzocchi quoted above. As stated above, it is Applicants' understanding of the Examiner's comments that all know high Tc superconductors can be made following Applicants' teaching. Thus the Examiner "offers no reason why one skilled in the are could not "make the" species that come within the scope of Applicants' genus claims.

In Ex parte Chen, an unpublished decision reported at 61 USPQ 1025, 1028, the Board of Patent Appeals and Interferences held claims to transgenic carp not unpatentable for lack of enablement stating:

> In responding to appellants' arguments, the examiner urges that the level of experimentation is undue and points to the success rate 1% or 20 out of 1746 attempts for the integration of the gene into the embryos described in the specification, (Answer, pages 6 and 14). However, the examiner offers no evidence which would reasonably support a conclusion that one skilled in this art would regard this rate of success for the integration of the rtGH gene as evidencing undue experimentation. We remind the examiner that some experimentation may be required as long as it is not undue. *In re Vaeck 941* F.2d 488, 496, 20 USPQ2d 1438, 1445 (Fed. Cir. 1991). Appellants' disclosure explicitly describes the methodology to be used to arrive at the claimed transgenic carp. As the record now stands, the numbers emphasized by the examiner would reasonably appear to reflect the need for a repetitive procedure, rather than un-due experimentation by those wishing to practice the invention.

Notwithstanding that the specification in Ex parte Chen disclosed only a 1% success rate in the examples described in the specification, the Board found the claims enabled since some experimentation may be needed to determine which examples work and which do not. The claims were found enabled since the

experimentation was not undue. The need for a repetitive procedure to determine which examples have the desired result does not render the claims not enabled. That is, there was "how-to-make-and-use predictability" in the Ex parte Chen invention even though there appeared to have been no "theoretical predictability" and even though the Ex parte Chen applicant could not foresee in advance, predict in advance or specifically teach in advance of experimentation which species had the desired result. Thus, that Applicants' specification describes examples that either do not show a Tc greater than or equal to 7.26 K or examples that have phases with and without a Tc greater than or equal to 26 K does not mean that they have not enabled their genus claims. Consequently, when the Examiner states as quoted above that "[t]he examiner does not deny ... that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to *26K,* such a person of skill in the art, using the techniques described in the application, ... can make the known superconductive compositions" (Emphasis in the original.), the Examiner is acknowledging that persons of skill in the art knew how to make species that come within the scope of Applicants' genus claims. That the species within this genus which have the desired high Tc property may be determined experimentally and not by a theoretical means according to the Board's decision in Ex parte Chen, does not mean that Applicants genus claims are not enabled. The CCPA agrees with this when it states:

> What the dissent seem to be obsessed with is the thought of catalysts which won't work to produce the intended result. Applicants have enabled those in the art to see that this is a real possibility, which is commendable frankness in a disclosure. Without undue experimentation or effort or expense the combinations which do not work will readily be discovered and, of course, nobody will use them and the claims do not cover them. The dissent wants appellants to make everything predictable in advance, which is impracticable and unreasonable. In re Angstadt. 190 USPQ 214, 219.

From this it is clear that 35 U.S.C. 112, first paragraph, does not require everything to be predictable in advance and permits the determination of the combinations that will and will not work by experimentation that is not undue.

The USPTO Board of Patent Appeals and Interferences in Ex parte Jackson 217 USPQ 804 (Bd. App. 1982) states at 217 USPQ 804, 806-807:

> The first paragraph of 35 U.S.C. 112 requires that the disclosure of an invention be "in such a full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains or with which it is most nearly connected, to make and use the same ... Decisional law has interpreted the statutory requirement as dictating that sufficient information be given in the application so that one of ordinary skill in the art can practice the invention without undue experimentation. ...
>
> The determination of what constitutes undue experimentation in a give case requires the application of a standard or reasonableness, having due regard for the nature of the invention and the state of the art. ...
>
> The test is not merely quantitative, since a considerable amount of experimentation is permissible if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed.

The Board states at 217 USPQ 806 "The issue squarely raised by [the] rejection [of claims] is whether or not a description of several newly discovered strains of bacteria having a particularly desirable metabolic property in terms of the conventionally measured culture characteristic and a number of metabolic and physiological properties would enable one of ordinary skill in the relevant art to independently discover additional strains having the same specific desirable metabolic property, i.e., the production of a particular antibiotic." Thus Applicants' respectfully submit that the Board in Ex parte Jackson would find a disclosure enabling that permits "one of ordinary skill in the relevant art to independently discover additional" high Tc materials that come within the scope of Applicants' generic claims, in particular in view of the Examiners' finding that "The examiner does not deny ... that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to *26K*, such a

person of skill in the art, using the techniques described in the application, ... can make the known superconductive compositions." (Emphasis in the original.)

The Board in Ex parte Jackson further states at 217 USPQ 808 "The problem of enablement of processes carried out by microorganisms were uniquely different from the field of chemistry generally. Thus, we are convinced that such recent cases as In re Angstadt 537 F.2d 498, 190 USPQ 214 (CCPA 1976) and In re Geerdes 491 F.2d 1260, 180 USPQ 789 (CCPA 1974) are in apposite to this case." Therefore, since the present application is not directed to biotechnology or microorganism invention, the decision of Ex parte Jackson does not apply, but In re Angstadt and In re Geerdes do apply.

Applicants note that the Board's decision, in Ex parte Jackson is that in determining whether there is enablement "a considerable amount of experimentation is permissible if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed." As stated above the Examiner agrees that the known high Tc superconductors can be made as described by Applicants. Thus Applicants have "provided guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed." Moreover, as stated above in the section of this brief directed to the summary of the claimed invention Applicants provide direction in the properties that they found the High Tc superconductors possess. Persons of skill in the art would look for other species having these properties. Subsequent work has corroborated Applicants' teaching as reported in Poole 1988, Poole 1995, Poole 1996, the Rao Article and the Schuller Article as noted above and below (Brief Attachments AF, AW, W, AG, AB and AZ.)

The Board in Ex parte Jackson further states at 217 USPQ 808 "The experimentation involved in the ordinary chemical case, including [In re Angstadt and In re Geerdes], usually arise in testing to establish whether a particular species within the generic claim language will be operable in the claimed process." As stated herein the method of "testing" to establish whether a particular species within the generic claim language will be superconductive with a $T_c \geq 26^{o}K$ is well known prior to Applicants' discovery. Also, the process for making the compositions is well known prior to the Applicants' discovery.

Applicants have extensively discussed In re Angstadt 190 USPQ 214 in their response dated 01/28/2005 in response to office action dated 07/28/2004 titled "Amendment." According to In re Angstadt 190 USPQ 214, 218 in an unpredictable art, §112 does not require disclosure of a test with every species covered by a claim. As stated herein it is Applicants' position that the present application is not directed to an unpredictable art. The CCPA states:

> To require such a complete disclosure would apparently necessitate a patent application or applications with "thousands" of examples ... More importantly, such a requirement would force an inventor seeking adequate patent protection to carry out a prohibitive number of actual experiments. <u>This would tend to discourage inventors from filing patent applications in an unpredictable area since the patent claims would have to be limited to those embodiments which are expressly disclosed. A potential infringer could readily avoid "literal" infringement of such claims by merely finding another analogous catalyst complex which could be used in "forming hydroperoxides."</u> (Emphasis Added)

Under In re. Angstadt, a patent application is not limited to claims covering embodiments expressly disclosed in their specification even in an unpredictable art. The CCPA In re Angstadt further states "[applicants] are *not* required to disclose every *species* encompassed by the claims even in an unpredictable art" 190 USPQ 214, 218. (Emphasis in the original). The CCPA further states that:

> "what is a maximum concern in the analysis of whether a particular claim is supported by the disclosure in an application, is whether the disclosure contains sufficient teaching regarding the subject matter of the claims as to enabled one of skill in the art to make and to use the claimed invention. These two requirements 'how to make' and 'how to use' have some times been referred to in

combination as the 'enablement requirement'... The relevancy may be summed up as being whether the scope of enablement provided to one of ordinary skill in the art by the disclosure as such as to be commensurate with the scope or protection sought by the claims. (190 USPQ 214,47 citing In re Moore 169 USPQ).

The enablement requirement is "how to make" and "how to use" the claimed invention and does not include knowledge in advance of all species that come within the scope of the claim. "[C]ommensurate with the scope of protection sought by the claims" is "how to make" and "how to use" the claimed invention which, as stated above, in Applicants' view the Examiner has acknowledged Applicants have satisfied the enablement requirement by the Examiner stating that "The examiner does not deny ... that once a person of skill in the art knows of a specific type of composition which is superconducting at greater than or equal to *26K,* such a person of skill in the art, using the techniques described in the application, ... can make the known superconductive compositions." (Emphasis in the original.)

The Board in Ex parte Jackson cited In re Geerdes 180 USPQ 789. The Court in In re Geerdes at 180 USPQ 793 states in reversing a rejection of claims under 35 U.S.C. 112, first paragraph, for lack of enablement "the area of technology involved here in not particularly complex and there is no evidence in the record to indicate that one of skill in the art would not be able to make and use the claimed invention." The area of technology involved in the present application in regard to making high T_c materials was well known prior to Applicants' discovery and the Examiner agrees that known high Tc materials can be made according to Applicants' teaching. As noted in the DST AFFIDAVITS (Brief Attachments AM to AO) described in detail below the level of skill in the ceramic fabrication art is high.

The Court in In re Geerdes further states at 180 USPQ 993 "The Board expressed concern that 'experimentation' is involved in the selection of proportions and particle sizes, but this is not determinative of the question of

scope of enablement. It is only undue experimentation that is fatal." There is no evidence that undue experimentation is needed "to make" materials to practice Applicants' claims. The Examiner refers to none.

The Court in In re Geerdes further states at 180 USPQ 793 "we cannot agree with the Board's determination that the claims are inclusive of materials which would not apparently be operative in the claimed process ... of course it is possible to argue that process claims encompass inoperative embodiments on the premise of unrealistic or vague assumptions, but that is not a valid basis for rejection." In the present application the Examiner's basis for rejection of Applicants' claims is impermissibly premised on unrealistic or vague assumptions, such as examples cited by Applicant having a $T_c < 26^{\circ}K$ and statements such as the theory of high Tc Superconductivity is not understood. As noted above, whether or not there is a theory of high Tc superconductivity is not determinative of whether the art of high Tc superconductivity is "unpredictable." An art is unpredictable if "how to make and use" is not well understood. If the existence of a theory enhances an understanding of "how to make and use," the theory increases the level of "predictability" of the art. If persons of ordinary skill in the art know "how to make and use" the claims of the invention, the absence of a theory does not result in the art being unpredictable.

That there may be later discovered species not specifically identified or suggested by Applicants' teaching may result in patents issued to the discovers of the later discovered species, but this does not mean that Applicants have not taught "how to make and use" such later discovered species even if there is no "theoretical predictability" so long as Applicants have taught how "to make and use," which Applicants assert they have done and for which it is Applicants' understanding of the Examiner's comments that this is also the Examiner's understanding. As stated above the Board, CCPA and the CAFC have held that experimental determination using known procedures even where such known procedures produce species that do not have the desired result satisfies the enablement requirement. For the reasons given herein, it is Applicants' position

that under In re Fisher and the other decisions referred to herein Applicants' claims are enabled and Applicants respectfully request the Examiner to withdraw the rejection of Applicants' claims under 35 USC 112, first paragraph, for lack of enablement.

APPLICABILITY OF IN RE ANGSTADT

The DST AFFIDAVITS (Brief Attachments AM, AN and AO) state:

> Once a person of skill in the art knows of a specific type of composition described in the Bednorz-Mueller application which is superconducting at greater than or equal to 26°K, such a person of skill in the art, using the techniques described in the Bednorz-Mueller application, which includes all principles of ceramic fabrication known at the time the application was initially filed, can make the compositions encompassed by the claims of the Bednorz-Mueller application, without undue experimentation or without requiring ingenuity beyond that expected of a person of skill in the art of the fabrication of ceramic materials. This is why the work of Bednorz and Mueller was reproduced so quickly after their discovery and why so much additional work was done in this field within a short period after their discovery. (See paragraph 8 of the DST Affidavits.)

The affidavits of Shaw, Dinger, Tsuei, Mitzi and Duncombe of Brief Attachments AH, AI, AJ, AK and AL have a similar statement.

In the paragraph at the bottom of page 15 of the specification, it is stated: in regard to compositions according to the present invention that "their manufacture generally follows the known principles of ceramic fabrication." Thereafter, an example of a typical manufacturing process is given.

The CCPA In re Angstadt and Griffin further states that:

> we cannot agree with the Board that Appellants' disclosure is not sufficient to enable one of ordinary skill in the art to practice the invention without undue experimentation. We note that many chemical processes and catalytic processes particularly, are unpredictable, ... , and the scope of enablement varies inversely with the degree of unpredictability involved... The question, then, whether in an unpredictable art, section 112 requires the disclosure of a test with every species covered by a claim. To require such a complete disclosure will apparently necessitate a patent application or applications with 'thousands ' of examples... . More importantly, such a requirement would force an inventor to seek adequate

patent protection to carry out a prohibited number of natural experiments. This would tend to discourage inventors in filing patent applications in an unpredictable area since the patent claim would have to be limited those embodiments which are expressly disclosed. A potential infringer could readily avoid 'infringement of such claims' by merely finding another analogous (example) which could be used 190 USPQ 124, 218.

Thus Applicants do not have to specifically identify in the specification all species that come within the scope of their claims.

The CCPA In re Angstadt further goes on to say

> having decided that appellants are *not* required to disclose every *species* encompassed by the claims even in an unpredictable art such as the present record presents, each case must be determined on its own facts. 190 USPQ 214, 218. (emphasis in the original).

In regards to the catalyst In re Angstadt and Griffin the CCPA further states:

> [s]ince appellants have supplied the list of catalysts and have taught how to make or how to use them, we believe that the experimentation required to determine which catalyst will produce hydroperoxide would not be undo and certainly would not 'require ingenuity beyond that to be expected of one of ordinary skill in the art'. 190 USPQ, 214, 218 in re Field v. Connover 170 USPQ, 276, 279 (1971).

As stated in the affidavits of Dr. Dinger (Brief Attachment AI), Dr. Tsuei (Brief Attachment AJ), Dr. Shaw (Brief Attachment AK), Mr. Duncombe (Brief Attachment AL), Dr. Mitzi (Brief Attachment AH) and in the DST AFFIDAVITS (Brief Attachments AM, AN and AO) to make the high temperature superconductors encompassed by Applicants' claims, using the teaching of the present invention would not require ingenuity beyond that expected of one of ordinary skill in the art. This is unrebutted by the Examiner.

The CCPA in In re Angstadt further states that:

[T]he basic policy of the Patent Act, ... is to encourage disclosure of inventions and thereby to promote progress in the useful arts. To require disclosures in patent applications to transcend the level of knowledge of those skilled in the art would stifle the disclosure of inventions in fields man understands imperfectly. 190 USPQ 214, 219.

The CCPA further states that:

[T]he certainty which the law requires in patents is not greater than is reasonable. 242 USPQ, 270-271, cited in In re Angstadt. 190 USPQ 214, 219.

In re Angstadt further states at 190 USPQ 219:

We note that the PTO has the burden of giving reasons, supported by the record as a whole, why the specification is not enabling. In re Armbruster, 512 F.2d 676, 185 USPQ 152 (CCPA 1975). Showing that the disclosure entails undue experimentation is part of the PTO's initial burden under Armbruster; this court has never held that evidence of the necessity for *any* experimentation, however slight, is sufficient to require the applicant to prove that the type and amount of experimentation needed is not undue.

By calling the claimed "invention" the "scope of protection sought" the dissent obscures the problem and frustrates the intended operation of the patent system. Depriving inventors of claims which adequately protect them and limiting them to claims which practically invite appropriation of the invention while avoiding infringement inevitably has the effect of suppressing disclosure. What the dissent seem to be obsessed with is the thought of catalysts which won't work to produce the intended result. Applicants have enabled those in the art to see that this is a real possibility, which is commendable frankness in a disclosure. Without undue experimentation or effort or expense the combinations which do not work will readily be discovered and, of course, nobody will use them and the claims do not cover them. The dissent wants appellants to make everything predictable in advance, which is impracticable and unreasonable.

> We hold that the evidence as a whole, including the inoperative as well as the operative examples, negates the PTO position that persons of ordinary skill in this art, given its unpredictability, must engage in undue experimentation to determine which complexes work. The key word is "undue," not "experimentation."

The passages quoted from the CCPA decision in In re Angstadt above provide the following eight factors:

1. The PTO has the burden of giving reasons why the specification is not enabling.
2. Showing that a disclosure requires undue experimentation is the PTO's initial burden.
3. That experimentation is needed to practice the claimed invention does not require the applicant to prove the experimentation needed is undue.
4. Depriving inventors of claims that adequately protect them invites others to practice their invention while avoiding infringement will suppress disclosure.
5. When an applicant discloses compositions that are within the scope of the claims that will not work to practice the invention, this does not result in the claim being not enabled, but is commendable honesty on the part of the inventor.
6. Examples that come within the scope of the claim that can be determined not to work without undue experimentation do not result in the claims not being enabled.
7. Everything does not have to be made predictable in advance.
8. To require everything to be made predictable in advance is impracticable and unreasonable.

These factors will be referred to herein as In re Angstadt Factors 1 to 8.

The only facts which the Examiner offers as evidence of unpredictability are examples provided in Applicants' specification. The CCPA in In re Angstadt says that this is "commendable frankness" which is not to be held against Applicants. The Examiner has provided no evidence that a person of skill in the art has to engage in undue experimentation to practice Applicants' non-allowed claims. The affidavits of Mitzi (Brief Attachment AH), Dinger (Brief Attachment AI), Tsuei (Brief Attachment AJ), Shaw (Brief Attachment AK) and Duncombe (Brief Attachment AL) The DST AFFIDAVITS Brief Attachments AM, AN and AO, and Poole 1988 (Brief Attachment AF and AW) Poole 1995 (Brief Attachment W) and Pool 1996 (Brief Attachment AG) explicitly indicate that persons of skill in the art do not have to engage in undue experimentation to practice Applicants' invention. The Examiner has provided no rebuttal to this evidence. Moreover, that Applicant's specification describe making samples which when tested, did not show high T_c superconductivity is not evidence of lack of enablement. If it were shown that these samples were in fact high T_c superconductors and could not be make following Applicants' teaching plus what is known to persons of skill in the art without undue experimentation, this may be evidence of lack of enablement, but there is no such evidence in the record here.

The Examiner cited In re Colianni 195 USPQ 150 which Applicants believe is not on point since in In re Colianni "[t]here is not a single specific example or embodiment by way of an illustration of how the claimed method is to be practiced." (195 USPQ 150, 152). In contradistinction as noted above, there are numerous examples cited in Applicants' specification and incorporated references. Thus this decision is not on point.

"Showing that the disclosure entails undue experimentation is part of the PTO's initial burden." In re Armbruster 185 USPQ 152, 504. The Examiner has not shown that undue experimentation is required to practice Applicants' claims to their full scope. Thus the Examiner has not made a prima facie showing no enablement.

"The practical approach followed consistently by [the CCPA] ..., places the initial burden on the PTO to show that the enabling disclosure is not commensurate in scope with the claim. Upon such a showing, the burden of rebuttal shifts to Applicants". In re Coliani 195 USPQ 150. Notwithstanding that the Examiner has not satisfied this initial burden, Applicants have provided evidence to show that their claims are fully enabled even though the burden for such a showing has not shifted to them.

"However, [the CCPA] has made it clear that the Patent and Trademark Office must substantiate its rejections for lack of enablement with reasons" In re Armbruster 185 USPQ 152, 153. The Examiner has merely asserted without support that "the art of high temperature superconductivity is unpredictable..." and noted that Applicants identify examples of compounds that do not have $T_c \geq 26^{\circ}K$. But examples that do not work that come within the scope of a claim does not result in the claim not being enabled. Moreover, there are no examples of compounds that do not work that come within the scope of applicants' claims. Applicants' claims by there construction only include within their scope compounds that work.

The CCPA in In re Marzocchi, 58 CCPA 1069, 439 F. 2d 220, 169 USPQ 367, 369-370 (1971) states:

> The only relevant concern of the Patent Office under these circumstances should be over the *truth* of any such assertion. The first paragraph of §112 requires nothing more than objective enablement. How such a teaching is set forth, either by the use of illustrative examples or by broad terminology, is of no importance.
>
> As a matter of Patent Office practice, then, a specification disclosure which contains a teaching of the manner and process of making and using the invention in terms which correspond in scope to those used in describing and defining the subject matter sought to be patented *must* be taken as in compliance with the enabling requirement of the first paragraph of §112 *unless* there is reason to

> doubt the objective truth of the statements contained therein which must be relied on for enabling support. Assuming that sufficient reason for such doubt does exist, a rejection for failure to teach how to make and/or use will be proper on that basis; such a rejection can be overcome by suitable proofs indicating that the teaching contained in the specification is truly enabling...
>
> [I]t is incumbent upon the Patent Office, whenever a rejection on this basis is made, to explain *why* it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning which is inconsistent with the contested statement. Otherwise, there would be no need for the applicant to go to the trouble and expense of supporting his presumptively accurate disclosure. [Emphasis in original footnote deleted].

Applicants have submitted affidavits of Dr. Mitzi, Dr. Tsuei, Dr. Shaw, Mr. Duncombe and Dr. Dinger (Brief Attachment AH, AI, AJ, AK) and the DST AFFIDAVITS (Brief Attachments AM, AN and AO) under 37 CFR 132 which state, as quoted above, that once a person of skill in the art knows of Applicants' work, the compositions encompassed by the claims under experimentation, can be made using the teaching of Applicants without undue experimentation thereby rebutting the Examiner's statement that:

> "[the specification ... [fails] to provide an enabling disclosure commensurate with the scope of the claims."

The Examiner has provided no example of a composition that comes within the scope of Applicants' claims that will work and that cannot be make following Applicants' teaching as of Applicants earliest filing date as required by In re Wright Supra 27 USPQ2d 1510, footnote 8 at page 1514, cites In re Hogan Supra 194 USPQ 527, 533 (CCCPA 1977).

At page 6 of the Office Action of 07/28/2004 in footnote 3 the Examiner cites In re Cook 169 USPQ 298, 302 and Cosden Oil v. American Hoechst 214 USPQ 244, 262 to support the statement "[c]laims broad enough to cover a large

number of compositions that do not exhibit the desired properties fail to satisfy the requirement of 35 USC 112." The quoted language is from Cosden Oil v. American Hoechst which is directed to claims to compositions of matter. The present claims are not directed to compositions of matter. Applicants' claims do not read on any inoperative species since Applicants' claims are apparatus of use claims. A composition which does not have a $T_c \geq 26$ K is not within the scope of the claims. Applicants note that Cosden Oil v. American Hoechst is a distinct court decision decided in 1982 and has not been cited to or followed by the CAFC in the more that 24 years since this decision. The USPTO Board of Patent Appeals and Interferences refers to Cosden Oil v. American Hoechst in Ex parte Westphal 26 USPQ 1858, 1860 and Nashef v. Pollack USPQ 1631, 1634 but for reasons different from the reason that the Examiner has cited in this case. Thus these decisions are not on point. Moreover, such examples are not evidence of lack of enablement according to In re Angstadt. (Factors 5 and 6 above)

At page 7 of the Office Action of 07/28/2004 in footnote 4 the Examiner cites In re Corkill 226 USPQ 1005, 1009 as support for this statement "[m]erely reciting a desired result does not overcome this failure". In sustaining a rejection for indefiniteness the CAFC held "[c]laims which include a substantial measure of inoperatives ... are fairly rejected under 35 USC 112 second paragraph." Thus In re Corkill holds claims indefinite under 35 USC 112, second paragraph, when the "claims do not correspond in scope to what they regard as their invention." The Examiner has cited In re Corkill for a rejection under 35 USC 112, first paragraph, to which it does not apply. Applicants' claims include no inoperatives and thus are not indefinite under In re Corkill. Since Applicants' claims are apparatus for use claims they are functional and thus exclude inoperatives. "[T]he use of functional language is sanctioned specifically by ... section 112." In re Angstadt 190 USPQ 214, 217.

At page 7 of the Office Action of 07/28/2004 in footnote 5 the Examiner cited Brenner v. Manson 148 USPQ 689 for the statement “a patent is not a hunting license. It is not a reward for the search, but a reward for its successful conclusion.” The claim in question was in Brenner v. Manson a method of making a composition. The composition had no known use. To issue a patent for such a process would be granting a hunting license for a utility that may occur in the future. The method was found to lack utility under 35 USC 101 and thus was found not be patentable subject matter. This is not relevant to §112, first paragraph, rejection for enablement and thus this quote from Brenner v. Manson is incorrectly applied by the Examiner. Thus this decision is not on point. Moreover, Applicants have had a successful conclusion, they won a Nobel Prize and initiated and enabled the high T_c superconductivity. This is undisputed.

Even if it were appropriate to apply this quote from the Brenner decision, it would only apply if undue experimentation were necessary to fabricate samples, not specifically fabricated by Applicants, that come within the scope of Applicants' claim. As clearly shown by Applicants, undue experimentation is not needed to practice the inventions of Applicants' rejected claims. All further developments were based on Applicants' teaching. Applicant's have taught “how to make and use” species within the scope of their claims. This is all that is necessary for enablement. The Brenner v. Manson statement may be applicable in the situation of enablement when an applicant seeks a claim for which it is not known “how to make and use” the invention. Under such a circumstance the applicant would be waiting with an issued patent as a “hunting license” for someone to discover “how to make and use” the invention. This is not the situation in the present application since Applicants have taught “how to make and use” their claimed invention.

The Examiner queries “[w]ill any layered perovskite material containing copper exhibit superconductivity?” and ”does any stoichiometric combination of rare earth, an alkaline earth, and copper elements result in an oxide

superconductor?" Since Applicants' claims are directed to apparatus of using compositions, Applicants' claims read on only those layered perovskite materials which exhibit superconductivity with a $T_c \geq 26K$ and do not read on an apparatus use of compositions which are not superconductive. Thus the Examiner's queries is not relevant to Applicants' claims. Applicants are not claiming a composition which is a high T_c superconductor. Thus Applicants' claims do not read on any layer perovskite, or any other stoichiometric combination, but only on those apparatus carrying a high T_c superconducting current. Apparatus of use claims are inherently narrower in scope than composition claims. A claim to a composition having a high T_c covers any use of that composition. Applicants' claims are limited to an apparatus, device, structure, etc where the composition is carrying a superconductive current. Moreover, it is undisputed that persons of skill in the art know "how to make and use" species that come within the scope of Applicants' claims. This is all that is necessary to satisfy 35 USC 112, first paragraph. There is no requirement that Applicants specifically identify, foresee, every specie that comes within the scope of Applicants' claims. Thus the Examiner's question is not relevant to the issue of whether Applicants' claims are enabled.

At page 6 of the Office Action of 07/28/2004 in footnote 3 the Examiner cites In re Cook. The invention in In re Cook was directed to four-member zoom lenses involving a complex set of design parameters. The CCPA in In re Cook 169 USPQ 298, 300 states:

> It seems to have been agreed by all concerned that the design of commercially satisfactory zoom lenses of the kind involved here (i.e., four-member zoom lenses) is an extremely complex and time-consuming operation, even with the aid of modern computer techniques. Thus, quite apart from appellants' teachings, it would take a lens designer setting out to design a new zoom lens of this type many months, or even years, to come up with a marketable lens assembly possessing all the desired characteristics.

The CCPA held that the In re Cook claims could not be found not enabled merely because following applicants teaching it would take a person of skill in the art a long time to design other embodiments within the scope of the claims (than were specifically described in the specification).

The CCPA in In re Cook 169 USPQ 298, 302 states:

> We agree that appellants' claims are not too broad "to the point of invalidity" just because they read on even a very large number of inoperative embodiments, since it seems to be conceded that a person skilled in the relevant art could determine which conceived but not-yet-fabricated embodiments would be inoperative with expenditure of no more effort than is normally required of a lens designer checking out a proposed set of parameters.

In In re Cook the CCPA held that even though the claims included inoperative species this did not render the claims unenabled since persons of skill in the art could determine "which conceived but not-yet-fabricated embodiments would be inoperative." That is a person of skill in the art could go through the time consuming and complex computation to determine whether a particular selected design within the scope of the claims functioned as a zoom lens. In In re Cook the CCPA found that the necessity of doing a complex time consuming calculation to determine whether a particular design was operable was not undue experimentation. This corresponds to the "theoretical experiment" referred to in the Affidavit of Newns (Brief Attachment AP). In the present application by analogy once a particular composition having a high T_c is known following the CCPA rational in In re Cook "a person skilled in the relevant art could determine which conceived but not-yet-fabricated embodiments would be inoperative with expenditure of no more effort than is normally required of a [person of ordinary skill in the ceramic fabrication art] checking out a proposed [composition by fabricating and testing it.]" by the well known methods of fabrication that do not require an understanding of the underlying complex chemistry as stated by Poole 1988, quoted above. See the DST AFFIDAVITS

(Brief Attachments AM, AN and AO.) Thus under In re Cook Applicants' claims are enabled.

The Examiner further states at page 7 of Office Action dated 07/28/2004:

> It should be noted that at the time the invention was made, the theoretical mechanism of superconductivity in these materials was not well understood. That mechanism still is not understood. Accordingly, there appears to be little factual or theoretical basis for extending the scope of the claims much beyond the proportions and materials actually demonstrated to exhibit high temperature superconductivity. A "patent is not a hunting license. It is not a reward for the search, but a reward for its successful conclusion".[5]

The Examiner has repeated grounds for rejection that Applicants have rebutted. The Examiner has not stated why Applicants' rebuttal does not overcome these grounds for rejection. The Examiner has provided no authority for the statement, "there appears to be little factual or theoretical basis for extending the scope of the claims much beyond the proportions and materials actually demonstrated to exhibit high temperature superconductivity." This is not one of the eight In re Wands factors. As described below Applicants have provided substantial factual basis for extending much beyond the proportions and materials actually demonstrated to exhibit high temperature superconductivity. (In particular see the DST AFFIDAVITS Brief Attachments AM, AN and AO.) A theoretical basis is not needed. The absence of a theoretical basis even if this were true is not adverse to Applicants' position that they have fully enabled their claims. There is no requirement to foresee all species that come within the scope of Applicants' rejected claims. As stated in In re Angstadt above the enablement requirement is "how to make" and "how to practice" the claimed invention. Whether a particular subject matter is "predictable" or "unpredictable" does not depend on whether there is a theoretical understanding. The Examiner has cited no authority to support the Examiner's view that a theoretical understanding of high T_c superconductivity is necessary for Applicants to be entitled to a generic claim where, as in the present application, persons of skill in

the art know how to make compositions and test that come within the scope of Applicants' claims.

The Examiner has provided no authority to show why the Examiner's statement "that at the time the invention was made, the theoretical mechanism of superconductivity in these materials was not well understood. That mechanism is still not understood," is relevant to whether Applicants' claims are enabled. Applicants' request the Examiner to identify authority to support this statement from the Patents Statute, Title 35 of the United States Code, from Title 37 of the Code of Federal Regulations, from decisions of the Board of Patent Appeals and Interferences or from the Courts. The Examiner further states "there appears to be little factual or theoretical basis for extending the scope of the claims much beyond the proportions and materials actually demonstrated to exhibit high temperature superconductivity." This is the Examiner's unsupported opinion. The five affidavits of Mitzi, Dinger, Tsuei, Shaw and Duncombe (Brief Attachments AH, AI, AJ, AK and AL) under 37 CFR 1.132, and the Poole book 1988 (Brief Attachment AK and AW), Poole 1995 (Brief Attachment Z), Poole 1996 (Brief Attachment AG), the Rao Article (Brief Attachment AB) described below provide factual evidence supporting Applicants' position that once a person of skill in the art knew from Applicant's article that ceramic compositions, such as oxides, in particular transition metal oxides, were high T_c superconductors, it was a matter of routine application of the general principles of ceramic science to fabricate such compositions, other than those actually made by Applicants. As stated above the Examiner agrees with this. Quoting Brenner v. Manson, 283 US 518, 148 USPQ 689, the Examiner further states that a "patent is not a hunting license. It is not a reward for the search, but a reward for its successful conclusion." Brenner v. Mason case has nothing to do with §112 enablement.

The Examiner further states at page 7 of Office Action dated 07/28/2004:

> Upon careful consideration of the evidence as a whole, including the specification teachings and examples, and applicant's affidavits and remarks, the Examiner has determined that the instant specification is enabled for compositions comprising a transition metal oxide containing an alkaline earth element and a rare-earth or Group IIIB element (as opposed to only compositions comprising BaxLas-xCusOy as stated in the Final Office action). Applicant has provided guidance throughout the instant specification that various transition metal oxides (such as copper oxide) containing an alkaline earth element and a rare-earth or Group IIIB element result in superconductive compounds which may in turn be utilized in the instantly claimed apparatus.

The Examiner has repeated grounds for rejection that Applicants have rebutted. The Examiner has not stated why Applicants' rebuttal does not overcome these grounds for rejection. As stated above in Ex parte Jackson, guidance is needed when experimentation is undue without the guidance. Since specific species do not have to be foreseen at the time of filing, guidance as used in regards to enablement does not mean identifying in advance all species that come within the scope of Applicants' claims when they can be determined without undue experimentation.

Applicants disagree that they have only enabled compositions containing an alkaline earth element and a rare earth or Group III B element to result in superconductive compounds which may in turn be utilized in the instantly claimed methods. There are numerous examples of high T_c superconductors made using the general principals of ceramic science as taught by Applicants. These principals existed prior to Applicants' discovery.

The CCPA in In re Robins 166 USPQ552, 555 has stated

> Both the Examiner and the board seem to have taken the position that in order to "justify," as the Examiner said, or to "support," as the board said, broad generic language in a claim, the specification must be equally broad in its meaning, and use

> in examples, of representative compounds encompassed by the claim language. This position, however, misapprehends the proper function of such disclosure. Mention of representative compounds encompassed by generic claim language clearly is not required by §112 or any other provision of the statute. But, where no explicit description of a generic invention is to be found in the specification (which is not the case here) mention of representative compounds may provide an implicit description upon which to base generic claim language. ... Similarly, representative examples are not required by the statute and are not an end in themselves. Rather, they are a means by which certain requirements of the statute may be satisfied. Thus, inclusion of a number of representative examples in a specification is one way of demonstrating the operability of a broad chemical invention and hence, establishing that the utility requirement of § 101 has been met. It also is one way of teaching how to make and/or how to use the claimed invention, thus satisfying that aspect of § 112.

Thus Applicants are not limited, as the Examiner has done, to claims only covering the specific examples that they have described in the specification.

The Examiner further states at page 8 of Office Action dated 07/28/2004:

> Applicant's remarks have been carefully considered. The following remarks are believed to address each of the issues raised by applicant. applicants' arguments, as well as the Affidavits filed 5/1/98, 5/14/98, 12/16/98 and 3/3/04 (1.132 Declarations of Mitzi, Tsuei, Dinger and Shaw) (Advisory mailed 2/25/99 (Paper 77E)) have been fully considered but they are not deemed to be persuasive.

The Examiner has provided no reason for why the 1.132 Declarations of Mitzi, Tsuei, Dinger and Shaw (Brief Attachments AH, AI, AJ, AK and AL) are not persuasive and the Examiner has made no comment on the DST Affidavits (Brief Attachments AM to AO) or the declaration of Bednorz (Brief Attachment AQ) or the Affidavit of Newns (Brief Attachment AQ).

The Examiner further states at page 8 of Office Action dated 07/28/2004:

> The additional case law and arguments by the applicants have been duly noted. For the reasons that follow, however, the record as a whole is deemed to support the initial determination that the originally filed disclosure would not have enabled one skilled in the art to make and use the invention to the scope that it is presently claimed.

The Examiner has repeated grounds for rejection that Applicants have rebutted. The Examiner has not stated why Applicants' rebuttal does not overcome these grounds for rejection. As stated above the CCPA In re Marzocci 169 USPQ 367, 369-370 states "[t]he only relevant concern of the Patent Office under these circumstances should be over the *truth* of any such assertion. The first paragraph of § 112 require nothing more than objective enablement." The Examiner has made no attempt to question the truth of Applicants assertions.

The Examiner again uses the word "deemed", that is, it is the Examiner's conclusory opinion unsupported by any factual evidence to question the truth of Applicants' assertions. The Examiner's reasons for why Applicants' claims are not enabled in the quoted passage are completely contrary to the Examiner's rejection under 35 USC 102(a) and 103(a) over the Ashai Shinbum article (which were earlier asserted against Applicants claims, but overcome by Applicants swearing behind the date of the Ashai Shinbum article which is described in detail below). Under these rejections the Examiner found the Asahi Shinbum article (Brief Attachment AV) would have enabled one skilled in the art to make and use the invention to the scope that it is presently claimed. As noted above, the Asahi Shinbum article relies upon Applicants' article (Brief Attachment AX). Applicants' view is further supported by the five affidavits of Mitzi, Tsuei, Dinger, Shaw and Duncombe (Brief Attachments AH to AL) under 37 CFR 1.132 the DST AFFIDAVITS (Brief Attachments AM, AN and AO) and Poole 1988 (Brief Attachment AF and AW) which will be described below and which states that once it was known from Applicants' article that materials, were superconductive

at temperatures greater than or equal to 26≥K, other high T_c materials, such as oxides, could be made by a person of skill in the art using the teaching of Applicants and the general teachings of ceramic science.

The Examiner further states on pages 8-9:

> Applicants argue that their disclosure refers to "the composition represented by the formula RE-TM-O, where RE is a rare earth or rare earth-like element, TM is a nonmagnetic transition metal, and O is oxygen", and list several species such as "La2-xBaxCUO4-y" which they indicate are found In the present disclosure.
>
> Notwithstanding that argument, it still does not follow that the invention is fully enabled for the scope presently claimed. The claims include formulas which are much broader than the RE-TM-O formula cited in the disclosure. Claim 24 recites "a transition metal oxide", claim 88 "a composition", and claim 96 "a copper-oxide compound".

The Examiner has repeated grounds for rejection that Applicants have rebutted. The Examiner has not stated why Applicants' rebuttal does not overcome these grounds for rejection, and the Examiner has given no reason to doubt the truth of Applicants assertions. The Examiner cites no example of a species that comes within the scope of Applicants' claims that cannot be made following Applicants' teaching.

Applicants respectfully disagree. In the priority document, (Brief Attachment AE) for example in the abstract, RE is a rare earth element, TM is a transition metal and O is oxygen. The priority document (Brief Attachment AE) further states at Col. 2, lines 22-25 "the lanthanum which belongs to the IIB group of elements is in part substituted by one member of the neighboring IIA group of elements..." Group IIA elements are the alkaline earth elements. The present specification teaches at page 11, lines 22-23, that RE stands for the rare earths (lanthanides) or rare earth-like elements. The "rare earth like element" acts like a rare earth element in the superconductive composition. Thus a rare earth-like

element is an equivalent of rare earth element. Similar language appears in the present specification at page 12 lines 6-8, "the lanthanum which belongs to the IIB group of elements is in part substituted by one member of the neighboring IIA group of elements...". Therefore, the priority document (Brief Attachment AE) teaches a "composition including a transition metal, a rare earth or rare earth-like element, and alkaline earth. Applicants note that in the passage quoted above, the Examiner incorrectly states that Applicants claim a composition. This is not correct. Applicants' claim an apparatus for flowing a superconducting current in a composition, such as a ceramic. (This characterization is exemplary only and not intended to limit the scope of any claims.) In the last sentence of the passage quoted above the Examiner incorrectly states "the claimed composition is **deemed** to be much broader than [the] formula" $RE_2TM.O_4$". The present specification and priority document (Brief Attachment AE) are not limited to this formula. The composition taught by the present specification and priority documents have variable amounts of oxygen, rare earth, rare earth-like and alkaline earth elements as is clearly shown in the abstract of the priority document.

The Examiner further states at page 9 of Office Action dated 07/28/2004:

> The present specification actually shows that known forms of "a transition metal oxide", "a composition" and "a copper-oxide compound" do not show the onset of superconductivity at above 26°K. At p. 3, line 20, through p. 4, line 9, of their disclosure, the applicants state that the prior art includes a "Li- Ti-O system with superconducting onsets as high as 13.7°K." Official Notice is taken of the well-known fact that Ti is a transition metal. That disclosure also refers to "a second, non-conducting CuO phase" at p. 14, line 18.

The Examiner has repeated grounds for rejection that Applicants have rebutted. The Examiner has not stated why Applicants' rebuttal does not overcome these grounds for rejection and the Examiner has given no reason to doubt the truth of Applicants assertions. The species of ceramic materials exist which do not have a $T_c \geq 26K$ is not evidence of lack of enablement. Every

ceramic composition does not have $T_c \geq 26K$ for there to be enablement. There may be lack of enablement if a species that is a high T_c superconductor cannot be make following Applicants' teaching as of Applicants' filing date. The Examiner has shown no evidence of this. Thus the Examiner has not made out a prima facie case of lack of enablement.

Applicants' claims are directed to an apparatus comprising "compositions", "transition metal oxides" "a composition" and "a copper-oxide compound" having a $T_c \geq 26°K$ which is carrying a superconducting current. Applicants' claims do not include in the claimed apparatus compositions having $T_c < 26°K$. Thus the examples on page 3, line 20 - page 4, line 9, are not included in Applicants' claims. That there are transition metal oxides having $T_c < 26°K$ does not mean that Applicants' claims directed to transition metal oxides, compositions and copper oxides having $T_c \geq 26°K$ are not enabled. Applicants provide the teaching on how to fabricate such compositions having $T_c \geq 26°K$ and that such compositions exist. The "second non-conducting CuO phase" referred to at page 14, line 18, again does not mean that Applicants' claims are not enabled. Applicants' statements at page 14 is part of Applicants' teaching on how to achieve an oxide having a $T_c \geq 26°K$. The Examiner is attempting to use Applicants' complete description of their teaching to show lack of enablement when, in fact, this complete teaching provides full enablement by showing how samples are and are not to be prepared. Applicants have claimed their invention functionally, that is, as an apparatus of use so the Applicants' claims do not read on inoperable species. What the Examiner "seems to be obsessed with is the thought of [compositions] which won't work to produce the intended result. Applicants have enabled those of skill in the art to see that this is a real possibility which is commendable frankness in a disclosure." In re Angstadt, Supra 190 USPQ 219. Thus, the CCPA has found that the existence of compositions that do not work does not mean that the claimed inventions are not enabled.

The Examiner further states at page 9 of Office Action dated 07/28/2004:

> Accordingly, the present disclosure is not deemed to have been fully enabling with respect to the "transition metal oxide" of claim 24, the "composition" of claim 88, or the "copper-oxide compound" of claim 96.

Again without facts or reasons to doubt Applicants' assertions the Examiner "deems" (that is, the Examiner conclusorily asserts) Applicants' claims are not enabled and for the reasons given above Applicants disagree. The only attempt at a factual support for the Examiner's statement are the examples provided by Applicants which show $T_c < 26°K$. Applicants provide this teaching so that a person of skill in the art will be fully informed on how to practice Applicants' invention.

The Examiner further states at page 10 of Office Action dated 07/28/2004:

> The availability requirement of enablement must also be considered in light of the scope or breadth of the claim limitations. The Board of Appeals considered this issue in an application which claimed a fermentative method using microorganisms belonging to a species. Applicants had identified three novel individual strains of microorganisms that were related in such a way as to establish a new species of microorganism, a species being a broader classification than a strain. The three specific strains had been appropriately deposited. The issue focused on whether the specification enabled one skilled in the art to make any member of the species other than the three strains which had been deposited. The Board concluded that the verbal description of the species was inadequate to allow a skilled artisan to make any and all members of the claimed species. Ex parte Jackson 217 USPQ 804, 806 (Bd. App. 1982).

Ex parte Jackson is not applicable to the present application. The Board in Ex parte Jackson states at 217 USPQ 804, 806-807:

> The first paragraph of 35 U.S.C. 112 requires that the disclosure of an invention be "in such a full, clear, concise and exact terms as to

> enable any person skilled in the art to which it pertains or with which it is most nearly connected, to make and use the same ... Decisional law has interpreted the statutory requirement as dictating that sufficient information be given in the application so that one of ordinary skill in the art can practice the invention without undue experimentation. ...
>
> The determination of what constitutes undue experimentation in a give case requires the application of a standard or reasonableness, having due regard for the nature of the invention and the state of the art. ...
>
> The test is not merely quantitative, since a considerable amount of experimentation is permissible if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed.

The Board states at 217 USPQ 806 "The issue squarely raised by [the] rejection [of claims] is whether or not a description of several newly discovered strains of bacteria having a particularly desirable metabolic property in terms of the conventionally measured culture characteristic and a number of metabolic and physiological properties would enable one of ordinary skill in the relevant art to independently discover additional strains having the same specific desirable metabolic property, i.e., the production of a particular antibiotic." Thus the Board in Ex parte Jackson would find a disclosure enabling that permits "one of ordinary skill in the art to independently discover additional" high T_c materials that come within the scope of Applicants' generic claims, in particular in view of the Examiner's factual finding at page 8 of the Final Action that "the Examiner does not deny ... that once a person of skill in the art knows <u>a specific type of composition which is superconducting</u> at greater than or equal to 26K, such a person of skill in the art, using the techniques described in the application, ... can make the known superconductive compositions." (Emphasis in the original) Thus following the Boards decision in Ex parte Jackson and this finding of fact by the Examiner Applicants' claims are enabled. As stated by the Examiner the experimentation to find other species is merely routine. The Board in Ex parte

Jackson goes on to state if the experimentation is not merely routine there is enablement "if the specification in question provides excessable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to produce a desired embodiment of the invention claimed." 217 USPQ 804, 807. This guidance is needed when the experimentation is not merely routine. Since there is no evidence in the present application that anything other that routine experimentation is needed to determine other species, than specifically described by Applicants', the guidance provided by Applicants' teaching is sufficient to satisfy enablement.

The Board in Ex parte Jackson further states at 217 USPQ 808 "The problem of enablement of processes carried out by microorganisms were uniquely different from the field of chemistry generally. Thus, we are convinced that such recent cases as In re Angstadt 537 F.2d 498, 190 USPQ 214 (CCPA 1976) and In re Geerdes 491 F.2d 1260, 180 USPQ 789 (CCPA 1974) are in apposite to this case." Therefore, since the present application is not directed to biotechnology or microorganism invention, the decision of Ex parte Jackson does not apply to the present application.

Applicants note that the Board states in Ex parte Jackson that in determining whether there is enablement, "a considerable amount of experimentation is permissible if it is merely routine, or in the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed." The Examiner agrees that the known high T_c superconductors can be made as described by Applicants. Thus Applicants have "provided guidance with respect to the direction in which the experimentation should proceed to enable determination of how to practice a desired embodiment of the claimed invention."

The Board in Ex parte Jackson further states at 217 USPQ 808 "The experimentation involved in the ordinary chemical case, including [In re Angstadt and In re Geerdes], usually arise in testing to establish whether a particular species within the generic claim language will be operable in the claimed process." As stated herein the method of "testing" to establish whether a particular species within the generic claim language will be "superconductive with a $T_c \geq 26K$ is well known prior to Applicants' discovery. See the DST AFFIDAVITS (Brief Attachments AM, AN and AO) in particular paragraphs 10 and 11 thereof. Also, the process for making the compositions is well known prior to the Applicants' discovery and the Examiner agrees that the known high T_c superconductors can be made following the Applicants' teaching. The Examiner has not rebutted this. (See Poole 1988 quoted above Brief Attachments AF and AW)

The Board in Ex parte Jackson cited In re Geerdes 180 USPQ 789. The Court in In re Geerdes at 180 USPQ 793 states in reversing a rejection of claims under 35 U.S.C. 112, first paragraph, for lack of enablement "the area of technology involved here in not particularly complex and there is no evidence in the record to indicate that one of skill in the art would not be able to make and use the claimed invention." The area of technology involved in the present application in regard to making high T_c materials was well known prior to Applicants' discovery. As indicated in the DST AFFIDAVITS (paragraphs 10 and 11) the level of skill in the art of making ceramic materials is high. This is unrebutted by the Examiner. Moreover, the Examiner has provided no reason "to indicate that one skilled in the art would not be able to make and use the claimed invention."

The Court in In re Geerdes further states at 180 USPQ 993 "The Board expressed concern that 'experimentation' is involved in the selection of proportions and particle sizes, but this is not determinative of the question of scope of enablement. It is only undue experimentation that is fatal." There is no

evidence that undue experimentation is needed "to make" materials to produce Applicants' claims.

The Court in In re Geerdes further states at 180 USPQ 793 "we cannot agree with the Board's determination that the claims are inclusive of materials which would not apparently be operative in the claimed process ... of course it is possible to argue that process claims encompass inoperative embodiments on the premise of unrealistic or vague assumptions, but that is not a valid basis for rejection." In the present application the Examiner's basis for rejection of Applicants' claims is impermissibly premised on unrealistic or vague assumptions, such as examples cited by Applicant having a $T_c < 26ºK$ and statements such as the theory of high Tc Superconductivity is not understood. As noted above whether there is a theory of high Tc superconductivity or not is not determinative of whether the art of high Tc superconductivity is "unpredictable." An art is unpredictable if "how to make and use" is not well understood. If the existence of a theory enhances an understanding of "how to make" and "use", the theory increases the level of "predictability" of the art. If persons of ordinary skill in the art know "how to make and use" the claims of the invention, the absence of a theory does not result in the art being unpredictable. The Examiner's reasons for asserting lack of enablement are premised on "unrealsitc or vague assumptions" without showing that undue experimentation is needed to practice Applicants' claimed invention.

Chapter 5 of Poole 1988 (Brief Attachment AF and AW) book entitled "Preparation and Characterization of Samples" states at page 59 "[c]opper oxide superconductors with a purity sufficient to exhibit zero resistivity or to demonstrate levitation (Early) are not difficult to synthesize. We believe that this is at least partially responsible for the explosive worldwide growth in these materials". Poole 1988 further states at page 61 "[i]n this section three methods of preparation will be described, namely, the solid state, the coprecipitation, and the sol-gel techniques (Hatfi). The widely used solid-state technique permits off-

the-shelf chemicals to be directly calcined into superconductors, and it requires little familiarity with the subtle physicochemical process involved in the transformation of a mixture of compounds into a superconductor." Poole 1988 further states at pages 61-62 "[i]n the solid state reaction technique one starts with oxygen-rich compounds of the desired components such as oxides, nitrates or carbonates of Ba, Bi, La, Sr, Ti, Y or other elements. ... These compounds are mixed in the desired atomic ratios and ground to a fine powder to facilitate the calcination process. Then these room-temperature-stabile salts are reacted by calcination for an extended period (~20hr) at elevated temperatures (~900°C). This process may be repeated several times, with pulverizing and mixing of the partially calcined material at each step." This is generally the same as the specific examples provided by Applicants and as generally described at pages 8, line 19, to page 9, line 5, of Applicants' specification which states "[t]he methods by which these superconductive compositions can be made can use known principals of ceramic fabrication, including the mixing of powders containing the rare earth or rare earth-like, alkaline earth, and transition metal elements, coprecipitation of these materials, and heating steps in oxygen or air. A particularly suitable superconducting material in accordance with this invention is one containing copper as the transition metal." (See Brief Attachments AF and AW.) Consequently, Applicants have fully enabled high T_c compositions, in particular for example ceramics, oxides transition metal oxides, etc of their claims. In particular, Applicants' claims that specifically recite that the superconducting element can be made by known principles of ceramic science are specifically and conclusory shown to be enabled by this statement from Poole 1988. See, for example claims 322 to 360, 414 to 427, 436, 455 to 465, 473 to 475, 484 to 441 and 552.

It is, therefore, clear that undue experimentation is not required to practice Applicants' claimed invention and that Applicants' teaching has sufficient guidance to satisfy enablement.

The Examiner further states at page 10-11 of Office Action dated 07/28/2004:

> In Enzo Biochem, Inc. v. Calgene, Inc., 188 F.3d 1362, 52 USPQ2d 1129 (Fed. Cir. 1999), the court held that claims in two patents directed to genetic antisense technology, (which aims to control gene expression in a particular organism), were invalid because the breadth of enablement was not commensurate in scope with the claims. Both specifications disclosed applying antisense technology in regulating three genes in E. coli. Despite the limited disclosures, the specifications asserted that the "[t]he practices of this invention are generally applicable with respect to any organism containing genetic material which is capable of being expressed." such as bacteria, yeast, and other cellular organisms." The claims of the patents encompassed application of antisense methodology in a broad range of organisms. Ultimately, the court relied on the fact that (1) the amount of direction presented and the number of working examples provided in the specification were very narrow compared to the wide breadth of the claims at issue, (2) antisense gene technology was highly unpredictable, and (3) the amount of experimentation required to adapt the practice of creating antisense DNA from E. coli to other types of cells was quite high, especially in light of the record, which included notable examples of the inventor's own failures to control the expression of other genes in E. coli and other types of cells.

The Examiner cites Enzo v Calgene 52 USPQ2d 1129 which is a biotechnology decision. This decision is not applicable to the present invention as stated by the Board in Ex parte Jackson as stated above. The Court in Enzo v. Calgene at 52 USPQ2d 1129, 1135 applies the facts of In re Wands 8 USPQ2d 1400.

The CAFC in Enzo at 52 USPQ2d 1129, 1138 cites In re Vaeck 20 USPQ2d 1438 stating:

> It is well settled that patent Applicants are not required to disclose every species encompassed by their claims, even in an unpredictable art. However, there must be sufficient disclosure, either through illustrative examples or terminology, to teach those

> of ordinary skill how to make and use the invention as broadly as it is claimed.

Applicants have satisfied the standard of In re Vaeck which is "to teach those of ordinary skill in the art how to make and how to use the invention as broadly as it is claimed." In re Vaeck does not require "theoretical predictability" to satisfy enablement. Moreover, Applicants' High Tc properties identified in the summary of the claims section are "illustrative...terminology" that teaches "those of ordinary skill in the art how to make and use the invention as broadly as it is claimed."

In Enzo Biochem plaintiff Enzo sued defendant Colgene Inc. for infringement of a patent with broad claims based on antisene strategies. There was evidence in the record that these strategies were not "universally applicable" and not "universally straight forward" which lead the district court to find the Enzo patents not enabled for lack of "how-to-make-and-use" predictability which resulted in undue experimentation to apply the claimed invention to asserted infringing use. The CAFC agreed. This is similar to the outcome of In re Fisher supra. In contradistinction in the present application on appeal the evidence in the record shows that prior to Applicants' discovery it was well known how to make the materials that come within the scope of Applicants' claims.

The MPEP SECTION---2164.01(a) entitled "Undue Experimentation Factors" citing In re Wands 8 USPQ2d 1400 states:

> There are many factors to be considered when determining whether there is sufficient evidence to support a determination that a disclosure does not satisfy the enablement requirement and whether any necessary experimentation is "undue." These factors include, but are not limited to:
>
> (A) The breadth of the claims;
> (B) The nature of the invention;
> (C) The state of the prior art;
> (D) The level of one of ordinary skill;
> (E) The level of predictability in the art;

(F) The amount of direction provided by the inventor;
(G) The existence of working examples; and
(H) The quantity of experimentation needed to make or use the invention based on the content of the disclosure.

The Examiner has not applied these factors. And in the final rejection the Examiner has not commented on nor rebutted applicants analysis of the application of the In re Wands factors to the present application in applicants Response dated 01/28/2005 in response to Office Action dated 07/28/2004. Applicants have shown that:

(A) Their claims are as broad as their discovery which is that compounds, such as ceramics, more particularly, oxides, metal oxides, transition metal, etc. can carry a superconductive current for a $T_c \geq 26$ K;

(B) The invention is easily practiced by a person of skill in the art;

(C) The state of the prior art clearly shows how to fabricate materials which can be used to practice Applicants' invention;

(D) The level of one of ordinary skill in the art to practice setting up a superconductor current in a particular material is not high since as stated in Poole 1988 (Brief Attachments AF and AW) materials to practice Applicants' invention are easily made and all that is needed to practice Applicants' claimed invention is to cool the material below, the T_c and to provide a current which will be a superconductive current. It has been well known how to do this since the discovery of superconductivity in 1911. (See page 1 of "Superconductivity" by M. Von Laue) (Brief Attachment AT and paragraph 9 of the DST AFFIDAVITS Brief Attachments AM, AN and AO). Moreover as stated above, "how to make" ceramic

materials is well known prior to applicants discovery. As described below the skill of the art in "how to make" ceramic materials is high, but well known to those of skill in the art and moreover, the chemistry involved does not have to be understood "to make" the materials and the theory of why there materials are high Tc superconductors does not have to be known to know "how to make" these materials.

(E) There is no unpredictability in how to make materials to practice Applicants' invention and there is no unknown in how to practice Applicants' invention. The only unknown is which particular composition will have a $T_c \geq 26°K$. As extensively shown by Applicants determining this is a matter of routine experimentation. The Examiner has not denied nor rebutted this.

(F) Applicants have provided extensive direction to make materials to practice their claimed invention. They have included all known principles of ceramic science. Also, as stated in the Poole 1988 book these materials are easily made. The Examiner has not denied nor rebutted this. The Examiner has made no comment on the amount of direction provided by the Applicants. As stated by the Board in Ex parte Jackson Supra, guidance is needed when the experimentation needed is not merely routine. There is no evidence that anything other than routine experimentation is needed to identify species within the scope of Applicants' claims as determined as of Applicants' earlier filing or priority date. As noted above Applicants' High Tc properties provide direction to skilled artisans on other species to make and test.

(G) Applicants have provided sufficient working examples and examples of compositions that have $T_c \geq 26°K$ for a person of skill

in the art to fabricate materials that can be used to practice Applicants' claimed invention; and

(H) Applicants have shown that the quantity of experimentation needed to make samples to use the invention based on the content of the disclosure in the specification is routine experimentation. The Examiner has not commented on this nor rebutted this.

The MPEP SECTION---2164.01(a) further states:

> The fact that experimentation may be complex does not necessarily make it undue, if the art typically engages in such experimentation. In re Certain Limited-Charge Cell Culture Microcarriers, 221 USPQ 1165, 1174 (Int'l Trade Comm'n 1983), aff'd. sub nom., Massachusetts Institute of Technology v. A.B. Fortia, 774 F.2d 1104, 227 USPQ 428 (Fed. Cir. 1985).
>
> See also In re Wands, 858 F.2d at 737, 8 USPQ2d at 1404. The test of enablement is not whether any experimentation is necessary, but whether, if experimentation is necessary, it is undue. In re Angstadt, 537 F.2d 498, 504, 190 USPQ 214, 219 (CCPA 1976). MPEP 2164

There is no statement by the Examiner nor any evidence in the record that the experimentation to make materials to practice Applicants' claimed invention is complex or undue. But it is clear that even if the experimentation was complex to make samples to practice Applicants' claimed invention, it would not render Applicants' claims not enabled since the art typically engages in the type of experimentation taught by Applicants to make samples to practice their claimed invention. The Examiner has not rebutted this.

The facts of In re Wands have similarity to the facts of the present application under examination. The Court at 8 USPQ2d 1406 held that:

The nature of monoclonal antibody technology is that it involves screening hybridomas to determine which ones secrete antibody with desired characteristics. Practitioners of this art are prepared to screen negative hybridomas in order to find one that makes the desired antibody.

Correspondingly Applicants have shown that the nature of high T_c technology is that it involves preparing samples to determine which ones have $T_c \geq 26°K$ - the desired characteristic. Practitioners of this art are prepared to prepare samples in order to find ones that have the desired T_c. Nothing more is required under In re Wands.

Applicants have shown that their specification is enabling with respect to the claims at issue and that there is considerable direction and guidance in the specification; with respect to Applicants' claimed invention there was a high level of skill in the art to fabricate samples at the time of Applicants' discovery; and all of the methods needed to practice the invention were well known at the time of Applicants' discovery. Thus Applicants have shown that after considering all the factors related to the enablement issue, it would not require undue experimentation to obtain the materials needed to practice the claimed invention. The Examiner has not denied nor rebutted this.

A conclusion of lack of enablement means that, based on the evidence regarding each of the above factors, the specification, at the time the application was filed, would not have taught one skilled in the art how to make and/or use the full scope of the claimed invention without undue experimentation. In re Wright, 999 F.2d 1557,1562, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993). It is the Examiner's burden to show this and the Examiner has clearly not done so.

The breadth of the claims was a factor considered in Amgen v. Chugai Pharmaceutical Co., 927 F.2d 1200, 18 USPQ2d 1016 (Fed. Cir.), cert. denied, 502 U.S. 856 (1991). In the Amgen case, the patent claims were directed to a

purified DNA sequence encoding polypeptides which are analogs of erythropoietin (EPO). The Court stated that:

> Amgen has not enabled preparation of DNA sequences sufficient to support its all-encompassing claims. . . . [D]espite extensive statements in the specification concerning all the analogs of the EPO gene that can be made, there is little enabling disclosure of particular analogs and how to make them. Details for preparing only a few EPO analog genes are disclosed. . . . This disclosure might well justify a generic claim encompassing these and similar analogs, but it represents inadequate support for Amgen's desire to claim all EPO gene analogs. There may be many other genetic sequences that code for EPO-type products. Amgen has told how to make and use only a few of them and is therefore not entitled to claim all of them. 927 F.2d at 1213-14, 18 USPQ2d at 1027.

The Amgen court found that "Amgen has told how to make and how to use only a few of [the species that comes within the scope of the genus claims] and is therefore not entitled to claim all of them." In contradiction, in the present application Applicants have provided a teaching (and proof thereof) of how to make all known high T_c materials useful to practice their claimed invention. As the Amgen court states this type of disclosure justifies a generic claim. As the In re Angstadt court states the disclosure does not have to provide examples of all species within Applicants' claims where it is within the skill of the art to make them. There is no evidence to the contrary.

In the prosecution of this application, Applicants have noted that the Examiner has taken a contrary view to Applicants' five affiants (Brief Attachments AH, AI, AJ, AK, AL, AM, AN and AO) each of whom has qualified himself as an expert in the field of ceramic technology and in superconductivity. Also, the Examiners' argument for nonenablement is primarily based on the Examiner **"deeming"** the rejected claims nonenabled based on the unsupported assertion that the art of high T_c is unpredictable and not theoretically understood, that is, the Examiner's conclusory opinion or belief that the claims are not enabled. As stated above even if the art of high Tc superconductivity is not

theoretically understood this does not mean that this art is unpredictable. In the prosecution of this application Applicants requested the Examiner to submit an affidavit to qualify himself as an expert to conclusorily **"deem"** the rejected claims nonenabled and to substantiate the unsupported assertions. The Examiner has not submitted an affidavit. 37 CFR 104(d)(2) states "[w]hen a rejection in an application is based on facts within the personal knowledge of an employee of the office ... the reference <u>must</u> be supported when called for by the Applicants, by an affidavit of such employee." (Emphasis Added) In the Final Action the Examiner cites two references in response to this statement which are responded to below.

The Examiner further states at page 11-12 of Office Action dated 07/28/2004:

> The examples at p. 18, lines 1-20, of the present specification further substantiates the finding that the invention is not fully enabled for the scope presently claimed.
>
> With a 1:1 ratio of (Ba, La) to Cu and an x value of 0.02, the La-,Ba-Cu-O form (i.e., "RE-AE-TM-O" per p. 8/ line 11) shows "no superconductivity", With a 2:1 ratio of (Ba/ La) to Cu and an x value of 0.15, the La-Ba-Cu-O form shows an onset of superconductivity at "T_c = 26°K". It should be noted, however, that all of the claims in this application require the critical temperature (T_c) to be "in excess of 26°K" or "greater than 26°K".

Applicant respectfully disagrees with the Examiner. All of the claims (except 543) require T_c to be greater that of equal to 26°K.

The Examiner further states at page 12 of Office Action dated 07/28/2004:

> The state of the prior art provides evidence for the degree of predictability in the art and is related to the amount of direction or guidance needed in the specification as filed to meet the enablement requirement. The state of the prior art is also related to the need for working examples in the specification. The state of the

> art for a given technology is not static in time. It is entirely possible that a disclosure filed on January 2, 1990, would not have been enabled. However, if the same disclosure had been filed on January 2, 1996, it might I have enabled the claims. Therefore, the state of the prior art must be evaluated for each application based on its filing date. 35 U.S.C. 112 requires the specification to be enabling only to a person skilled in the art to which it pertains, or with which it is most nearly connected."

Notwithstanding the Examiner's comments the Examiner has the burden of showing that the claims are not enabled by a reasonable argument which the Examiner has not done. The Examiner has presented no evidence or argument that undue experimentation is required to make composition that can be used to practice to the full scope of Applicants' claims based on applicants' teaching. The three Affidavits of Tsuei, Dinger and Shaw (Brief Attachments AM, AN, AO) describe in detail what a person of ordinary skill in the art knew prior to Applicants discovery and how this knowledge was used in view of Applicants' teaching to make other species within the scope of Applicants' claims without undue experimentation. This is described in detail below.

The Examiner further states at page 12-13 of the Office Action dated 07/28/2004:

> The Applicants also have submitted three affidavits attesting to the applicants' status as the discoverers of materials that superconduct > 26°K. Each of the affidavits further states that "all the high temperature superconductors which have been developed based on the work of Bednorz and Muller behave in a similar manner (way)". Each of the affidavits add" (t)hat once a person of skill in the art knows of a specific transition metal oxide composition which is superconducting above 26°K, such a person of skill in the art, using the techniques described in the (present) application, which includes all known principles of ceramic fabrication, can make the transition metal oxide compositions encompassed by (the present) claims ... without undue experimentation or without requiring ingenuity beyond that expected of a person of skill in the art." All three affiants apparently are the employees of the assignee of the present application.

> Those affidavits do not set forth particular facts to support the conclusions that all superconductors based on the applicants' work behave in the same way and that one skilled in the art can make those superconductors without undue experimentation. Conclusory statements in an affidavit or specification do not provide the factual evidence needed for patentability.

In this passage the Examiner incorrectly states Applicants submitted three affidavits. Prior to the Office Action of 07/28/2004 Applicants' submitted the five affidavits of Brief Attachments AH, AI, AJ, AK, AL of Mitzi, Dinger, Tsuei, Shaw and Duncombe, respectively. Subsequent to the Office Action of 07/28/2004 Applicants submitted the expanded affidavits of Shaw, Tsuei and Dinger of Brief Attachments AM, AN and AO respectively.

The Examiner cited In re Lindner, 173 USPQ 356, 358 (CCPA 1972) in support of this statement. In In re Lindner the patent applicant submitted Rule 132 affidavit based on one example to show unexpected results for a claim of broader scope. The CCPA held that "[i]t is well established that objective evidence of non-obviousness must be commensurate in scope with the claims." In re Lindner is not on point since it does not deal with the issue of enablement. In re Linder the applicant sought to avoid a prior art reference. The CCPA in this quoted passage is stating that the 132 affidavit must show that the applicant was in possession of the full scope of the claimed invention prior to the date of the reference. In re Linder stands for the position that a single example may not be sufficient to establish this. A single example can enable a broader scope claim where nothing more is needed than what is taught by Applicants or what is taught by Applicants together with what is know by a person of skill in the art.

The five affidavits of Mitzi, Tsuei, Dinger, Shaw and Duncombe (Brief Attachments AH, AI, AJ, AK and AL) are statements of experts in the ceramic arts. The Examiner disagrees with these experts. But the Examiner has not submitted an Examiner's affidavit qualifying himself as an expert to rebut the statements of Applicants' affiants. To address the Examiner's comment, "those

affidavits do not set forth particular facts to support the conclusions that all superconductors based on the Applicants' work behave in the same way and that one skilled in the art can make those superconductors without undue experimentation", Applicants have submitted in response to the OA 07/28/2004 the additional affidavits of Dinger, Shaw and Tsuei (Brief Attachments AM, AN and AO) each of which extensively describes what persons of skill in the art knew prior to Applicants' discovery. In the Final Action the Examiner has not commented on these expanded affidavits. These will be described in detail below.

The Examiner further states at page 14 of the Office Action of 07/28/2004:

> Those affidavits do not overcome the non-enablement rejection. The present specification discloses on its face that only certain oxide compositions of rare earth, alkaline earth, and transition metals made according to certain steps will superconduct at > 26°K.

Applicants disagree. The affidavits of Shaw, Dinger, Tsuei, Mitzi and Duncombe (Brief Attachments AH, AI, AJ, AK and AL) cites numerous books and articles which provide the general teaching of ceramic science at the prior to Applicants' discovery. The affidavit of Duncombe (Brief Attachment AL) also provides several hundred pages copied from Mr. Duncombe's notebooks starting from before Applicants' filing date. In regards to these pages, Mr. Duncombe states "I have recorded research notes relating to superconductor oxide (perovskite) compounds in technical notebook IV with entries from November 12, 1987 to June 14, 1989 and in technical notebook V with entries continuing from June 7, 1988 to May 1989." Mr. Duncombe's affidavit list some of the compounds prepared using the general principles of ceramic science: $Y_1\,Ba_2\,Cu_3\,O_x$; $Y_1\,Ba_2\,Cu_3\,O_3$; $Bi_{2.15}\,Sr_{1.98}\,Ca_{1.7}\,Cu_2\,O_{8+8}$; $Ca_{(2-x)}\,Sr_x\,Cu\,O_x$ and $Bi_2\,Sr_2\,Cu\,O_x$.

The Examiner further states at page 14 of Office Action dated 07/28/2004:

> Those affidavits are not deemed to shed light on the state of the art and enablement at the time the invention was made. One may know now of a material that superconducts at more than 26°K, but the affidavits do not establish the existence of that knowledge on the filing date for the present application. Even if the present application "includes all known principles of ceramic fabrication", those affidavits do not establish the level of skill in the ceramic art as of the filing date of that application.

It is not relevant that Applicants disclosed specific compositions. There is no evidence in the record to indicate that anything more is needed to fabricate compositions which can be used to practice Applicants' invention to the full scope that it is claimed in the present invention. To the contrary, Applicants have shown numerous examples in the affidavits and references of samples fabricated according to Applicants' teaching useful to practice their claimed invention. Notwithstanding, since the claims are apparatus and device claims, Applicants do not believe that they are required to provide a specific teaching of how to fabricate all compositions which may be used within the full scope of Applicants' claimed invention. This is not required even with respect to claims directed to a chemical composition as clearly stated by In re Angstadt Factor 8 supra - "The dissent wants appellants to make everything predictable in advance, which is impracticable and unreasonable." 185 USPQ 152. Moreover, applicants in response to the OA 07/28/2005 have submitted additional affidavits of Shaw, Dinger and Tsuei, (Appeal Brief Attachments AM, AN and AO) described in detail below, that show the state of the art prior to applicants discovery and how that knowledge in combination with Applicants' discovery lead without undue experimentation to other species that come within the scope of Applicants' claims.

The Examiner states referring to the five affidavits in Attachments AH, AI, AJ, AK and AL that "these affidavits are not deemed to shed light on the state of the art and enablement at the time the invention was made," that is, it is the Examiner's conclusory opinion. Applicants disagree. The affidavits clearly state that all that is needed is Applicants' teaching and the ordinary skill of the art to

practice Applicants' claimed invention. This view is corroborated by Poole 1988 (Brief Attachments AF and AW) which as noted above clearly states that the chemistry involved in making high T_c superconductors does not have to be understood which is a significant factor in why Applicants' discovery was duplicated and other species within the scope of their claims were found in a short time after Applicants' discovery. Under 35 USC 112, first paragraph all that is necessary is "[t]he specification shall contain a written description ... to enable any person skilled in the art ... to make and use the same." Applicants initiated the filed of high T_c superconductors. If a person of skill in the art from the description in Applicants' specification can practice Applicants' claimed invention, it is enabled. Applicants are not required to show that a person of skill in the art had the knowledge prior to Applicants' invention. If this were the case, Applicants would not be the first, sole and only inventors, since the invention would be known by others. Applicants teach ceramic processing methods to fabricate high T_c superconductors. This uses general principles of ceramic science known prior to Applicants' discovery. Thus Applicants' claims are fully enabled. The Examiner has provided no evidence to the contrary. The Examiner has produced no evidence to demonstrate that a person of skill in the art, at the time of Applicants' discovery, could not practice the claimed invention from Applicants' teaching. The utilization of such teaching to practice Applicants' claimed invention was not known prior to Applicants' discovery. That is Applicants' discovery and thus why they are entitled to their claimed invention.

The Examiner further states at page 14 of Office Action dated 07/28/2004:

> It is fully understood that the applicants are the pioneers in high temperature metal oxide superconductivity. The finding remains, nonetheless, that the disclosure is not fully enabling for the scope of the present claims.

If Applicants pioneered the field of high T_c superconductivity, that is, they initiated the substantial worldwide effort to validate their discovery and to synthesize others specific embodiment of their generic and specific teaching,

then Applicants should be entitled to generic claims since others based their work on Applicants' teaching. The Examiner's conclusion "that disclosure is not full enabling for the scope of the present claims" has not been supported, evidence that undue experimentation is necessary to practice Applicants' claims and thus the Examiner has not made a prima facie showing of no enablement.

The Examiner further states at page 15-16 of Office Action dated 07/28/2004:

> The applicants quote a statement from "part of the previous Office Action and asserts that the "Examiner does not support this statement with any case law citations." That assertion is incorrect. Seven decisions have been cited as providing the legal basis for this determination of non-enablement.[7]

The Examiner has cited the following seven decisions, which have been discussed in detail above, in support for the determination of non-enablement: In re Fisher, 166 USPQ 18, 24; and In re Angstadt and Griffin, 190 USPQ 214, 218. In re Colianni, 195 USPQ 150, 153, 154 (CCPA 1977). In re Cook, 169 USPQ 298, 302; and Cosden Oil v. American Hoechst, 214 USPQ 244, 262. In re Corkill, 226 USPQ 105, 1009. Brenner v. Manson, 383 US 519, 148 USPQ 689.

The Examiner has not applied the rational of these decisions. In fact, in the prosecution Applicant pointed out that the Examiner seems to have specifically avoided applying this case law and, consequently, Applicants take the Examiner's silence as concurrence in the manner that Applicants have applied this case law. As described above, it is Applicants view that the Examiner is misapplying this case law.

The Examiner further states at page 15 of Office Action dated 07/28/2004:

> The applicants argue that their own examples do not support the determination of non-enabling scope of the invention. Nevertheless,

> the record is viewed as a whole. If the applicants could not show superconductivity with a $T_c > 26°K$ for certain compositions falling within the scope of the present claims, it is unclear how someone else skilled in the art would have been enabled to do so at the time the invention was made.

The Examiner incorrectly states "Applicants could not show superconductivity with $T_c > 26°K$ for certain compositions falling within the scope of the present claims." The claims of the parent application were directed to a method of flowing a superconducting current in a composition having a $T_c \geq 26°K$. The corresponding claims herein are directed to an apparatus flowing a superconducting current in a composition having a $T_c \geq 26°K$. If a composition has a $T_c < 26°K$, a method or apparatus for flowing a superconducting current in such a compound cannot fall within the scope of Applicants' claims. Applicants are not claiming a composition of matter. They are claiming their discovery, an apparatus passing a superconductive current through a composition, such as a oxide having a $T_c \geq 26°K$. No one prior to Applicants knew this. That is why they received the Nobel Prize in Physics in 1987. Moreover, it appears that the Examiner is stating that if following Applicants' teaching a sample is made that does not have a high Tc, this automatically renders Applicants' genus claims not enabled. The Examiner cites no authority for this position. Applicants respectfully submit that this position is inconsistent with the law of enablement which is directed to "how to make and use" the claimed invention. Samples made following Applicants teaching which do not have high Tc is not evidence that undue experimentation is necessary to make a sample having the desired Tc property. The Examiner has not shown that samples described by Applicant not having the desired high Tc are in fact high Tc materials which cannot be made according to Applicants teaching as of Applicants' earliest filing or priority date. Samples actually made is evidence of the enablement of how to make those samples. Testing such samples is evidence of how to use these samples. That after such testing it is determined that such a composition does not come within the scope of the claim is not evidence of lack of enablement but is evidence of routine screening permitted by decisions such as Ex parte Jackson Supra.

Applicants do not have to foresee all species that come within the scope of their claims.

The Examiner avoids the essential issues. Even though Applicants' claims do not cover inoperable species, In re Angstadt clearly permits a claim to include inoperable species where to determine which species works does not require undue experimentation. The Examiner has not met the USPTO's burden of showing that undue experimentation is needed to determine which compositions have $T_c \geq 26°K$ and which have $T_c < 26° K$ as required by In re Angstadt, supra. The Examiner has not presented any substantial evidence that undue experimentation is required to practice Applicants' claim. This is the Examiner's burden. On the other hand, Applicants have presented the five affidavits of Dinger, Mitzi, Tsuei, Shaw and Duncombe (Brief Attachments AH, AI, AJ, AK, AL, AM, AN and AO) of experts, the three additional affidavits of Dinger, Tsuei and Shaw (Brief Attachments AM, AN and AO) Poole 1988 (Brief Attachments AF and AW), Poole 1995 (Brief Attachment W), Poole 1996 (Brief Attachment AG), and the article of Rao (Brief Attachments AB), the list in the Handbook of Chemistry and Physics and the books and articles cited in the list (Brief Attachment AC and the Artifacts of this application referred to in Advisory Action dated 8/14/2006) and the article by Schuller et al. (Brief Attachments AZ), The article of Schuller states at page 4 "of course enlightened" empirical searches guided by chemical and materials intuition or schematic searches using well-defined strategies ... with the oxides gave rise to many super conducting systems" cited by the Examiner in the Final Action. All of Applicants' evidence support Applicants' statement that once a person of skill in the art knows of Applicants' invention, it is straight forward to fabricate other sample. Also, in response to the Examiner's inquiry, "if the Applicants could not show superconductivity with a $T_c > 26°K$ for certain compositions falling within the scope of the present claims, it is unclear how someone else skilled in the art would have been enabled to do so at the time the invention was made," it is clear that a person of skill in the art would have been enabled by routine

experimentation following Applicants' teaching to determine other samples with $T_c \geq 26°K$ and other samples that do not have such a T_c. As stated by In re Cook supra this is all that is required, and there is no evidence in the record to the contrary. Applicants again note that the Examiner incorrectly states samples with $T_c < 26$ K come within the scope of Applicants' claims. That there are samples made according to the principals of ceramic science that do not have $T_c \geq 26$ K is not evidence of lack of enablement. Moreover, none of these come within the scope of Applicants' claims.

The Examiner further states at page 15 of Office Action dated 07/28/2004:

> The applicants assert that "(b)y the Examiner's statement that these (statements in the affidavits) are conclusionary (sic) the Examiner appears to be placing himself up as an expert in the field of superconductivity" and "respectfully request that the Examiner submit an affidavit in the present application rebutting the position taken by applicants' 3 affiants." Notwithstanding those assertions, this Examiner has determined that those affidavits were insufficient because they were conclusory only, i.e., they lacked particular facts to support the conclusions reached.

The Examiner further states that Applicants' affidavits (Brief Attachments AH, AI, AJ, AK and AL) are conclusory. The Examiner appears to be placing himself up as an expert in the field of superconductivity. Applicants requested that the Examiner submit an affidavit in the present application rebutting the position taken by Applicants' five affiants, but the Examiner has not submitted an affidavit. The facts are that the five affiants are experts in the art, the Examiner is not. The Examiner states that those "affidavits were insufficient because they were conclusory only, i.e., they lacked particular facts to support the conclusions reached". Applicants submitted the affidavit of Peter Duncombe (Brief Attachments AL) which has provided hundreds of pages of notebook entries showing that he fabricated superconductive compositions according to the teaching of Applicants' specification. Moreover, Applicants have submitted the additional affidavits of Dinger, Tsuei and Shaw (Appeal Brief Attachments AM,

AN and AO) described in detail below. Subsequent to submitting the Affidavits of Appeal Brief Attachments AM, AN and AO the Examiner has stated at page 8 of the Final Office Action, "The Examiner does not deny ... that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to *26K*, such a person of skill in the art, using the techniques described in the application, ... can make the known superconductive compositions." (Emphasis in the original.) Thus it is the Examiner's finding of fact that the "known superconductive compositions" are " based in some way on [applicants'] teachings" and thus under In re Fisher Supra, Applicants "should be allowed to dominate the future patentable inventions of others."

The Examiner has provided no substantial evidence to support this assertion of non-enabling scope of the invention. It is requested that the Examiner support his assertion with factual evidence or an Examiner's affidavit and not unsupported statements.

The Examiner further states at page 16 of Office Action dated 07/28/2004:

> The applicants argue that the "Examiner has provided no substantial evidence to support this assertion (of non-enabling scope of the invention). It is respectfully requested that the Examiner support (his) assertion with factual evidence and not unsupported statements." Nevertheless, the determination of non-enabling scope is maintained for the reasons of record.

The Examiner has the burden of showing that the claims are not enabled. The Examiner has merely asserted that the theory of high T_c superconductivity was not understood at the Applicants' priority date. Applicants do not have to have a theory of high T_c superconductivity in order for their teaching to enable their claims. It is only necessary that a person of ordinary skill in the art be able to practice the claimed invention from Applicants' teaching without undue experimentation. The Examiner has not shown that undue experimentation is necessary to practice the claims of Applicants' invention. The Examiner has

merely stated that since Applicants' teaching shows that there are materials which are not superconducting with $T_c \geq 26°K$, this is evidence as lack of enablement. Such materials do not come within the scope of Applicants' claims since Applicants' claims only include those materials that are superconducting. Applicants' affidavits have shown that the method of making the materials was well known in the art prior to Applicants' discovery. Thus persons of ordinary skill in the art knew how to make these materials. Which particular compositions have $T_c \geq 26°K$ is determined by routine experimentation which is within the skill of the art as stated by Applicants' affidavits. The CCPA in In re Cook supra says nothing more is required. The Board in Ex parte Jackson Supra states nothing more is required. The Examiner's statement "Nevertheless, the determination of nonenabling scope is maintained for the reasons of record" is not responsive to the evidence presented by Applicants. There is no rebuttal or showing of its inadequacy to establish enablement.

The Examiner further states at page 16 of Office Action dated 07/28/2004:

> The applicants argue that the "standard of enablement for an apparatus is not the same as the standard of enablement for a composition of matter" and that their claimed invention is enabling because it is directed to a method of use rather than a composition. Basis is not seen for that argument, to the extent that it is understood. It is noted that 35 U.S.C. 112, first paragraph, reads as follows:

The Examiner is applying an incorrect standard of enablement. The Examiner is applying a standard applicable to composition of matter. Applicants are not claiming a composition of matter. As shown by Applicants' prior comments Applicants have in fact fully enabled the composition of matter. Therefore, Applicants have provided excess enablement for the claimed invention. The enablement for a claim directed to use of a material (e.g., a method of or an apparatus for use of the material), directed to the apparatus or method of use is more limited than the enablement for a composition of a matter. Notwithstanding, it is well settled law that claims to a composition of matter can

encompass a number of inoperable species. However, Applicants' claims do not cover any inoperable species. The claims only encompass apparatus for flowing a superconducting current in compositions that are superconductors with a $T_c \geq 26°K$. Those compositions that are not superconducting with a $T_c \geq 26°K$ are not encompassed by Applicants' claims reciting these limitations. Applicants note that a claim to a composition of matter is dominant to any use of that composition of matter and claims directed to an apparatus for use of a composition of matter are necessarily of narrower scope than claims to the composition of matter. Applicants' claims do not encompass uses other than those which the claims are limited to by the use limitations recited in the claims. Applicants' claims are directed to what they have discovered. Therefore, Applicants' claims fully satisfy the requirements of 35 USC 112.

The claimed invention is enabled because it is directed to an apparatus of use rather than a composition. Applicants are claiming their discovery, comprising an apparatus comprising a superconducting current in a composition with a $T_c \geq 26°K$. If a patent applicant claims an apparatus for flowing current through a circuit having a resistive element, the applicant does not have to describe every method of making every type of resistive element for the claim to dominate all resistive elements. Such a claim reads on resistive elements made of materials not known at the time of filing since the discovery is not the material but the apparatus for use. Applicants discovered that a superconducting current can be flowed in a composition having a $T_c \geq 26°K$. That is what Applicants are claiming. This is analogous to a claim to a composition of matter based on a single disclosed use. The composition of matter claim covers all uses even those not disclosed.

Process of use or apparatus for use claims are subject to the statutory provisions of 35 USC 112, first paragraph. All that is necessary to satisfy §112 is the statement that a superconducting current can be passed through a composition, such as ceramic material, more particularly metal oxides having a

$T_c \geq 26°K$. How to make there materials was well understood prior to Applicants' discovery. The Examiner has not disagreed with this. The Examiner has essentially said this by rejecting Applicants' non-allowed claims as obvious under §103(a) in view of the Asahi Shinbum article (Brief Attachment AV) described below. Since Applicants' generic teaching does not prevent others from obtaining patents to specific formulas, Applicants are entitled to generic claims to their discovery. Applicants filed this application soon after their discovery. Applicants published their results soon after their discovery. This was the quickest way to promote the progress of the field of high T_c superconductivity which can have substantial societal benefits such as less expensive electric power and more effective medical diagnostic tools. It is a policy of the United States Constitution, which establishes the United States Patent System, to encourage early disclosure of inventions to promote the progress of the useful arts. The Examiner's position that Applicants' generic claims are not fully enabled frustrates this policy. Applicants could have decided not to publish Applicants' article and not to file the present application while engaging in years of further experimentation to find all specific examples which had the optimal T_c. If Applicants acted this way, there would not have been the explosive worldwide effort to fully explore and implement high T_c technology. The rationale used by the Examiner is contrary to the Constitutional policy to promote the progress of the useful arts by early disclosure of an invention and contrary to the CCPA decision in In re Angstadt. Early disclosure should not be a penalty to Applicants. Applicants are pioneers in discovering that compositions, such as, ceramics, more particularly oxides, have $T_c \geq 26°K$. A first discoverer of a wheel whose specific embodiment is a solid disc rotateable about an axle can claim a cylindrical member adapted for rotation about the axle and for rolling on a surface, that is, their discovery. This claim is dominant to a latter inventor's improved wheel comprising spokes which has the advantage of much lighter weight than a disc. The latter inventor is entitled to a species claim within the scope of the dominant claim to a wheel. Applicants are entitled to a dominant

claim to their discovery. The Examiner's rational would preclude this. The dissent in In re Knowlton states:

> The protection granted, if appellant's claims are allowed, gives him the right to exclude others from making, using, or selling the invention. 35 USC 154. No right is granted which includes the right to use. Thus, a subsequent inventor of a new and unobvious method of scrambling may obtain a patent which, by the terms of its grant, is subservient to appellant's patent. However, the subsequent inventor would have the right to exclude appellant from making, using, or selling the later invention. For that reason, broad protection may be granted here without requiring disclosure of every embodiment within the scope of the claims.

In re Knowlton, 500 F.2d 566, 573 (C.C.P.A. 1974)

The Examiner further states at page 16 :

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention. Apparatus claims also would be subject to the statutory provisions of 35 U.S.C. 112, first paragraph.

Applicants' invention is a device, apparatus, structure, etc having a $T_c \geq 26°K$ element through which a superconducting current is flowing. Applicants discovered that materials had a $T_c \geq 26°K$. Applicants did not discover how to make these materials, which was well known prior to Applicants' discovery. Also, it was well known prior to Applicant's discovery how to cause superconducting currents in materials having a T_c at lower temperatures. Applicants do not have to specifically describe every composition that come within the scope of their claims. Applicants only have to provide a teaching based on which those compositions can be made by a person of ordinary skill in the art with out undue experimentation. Applicants' have done this and the Examiner has not rebutted this by showing any data or argument that persons of skill in the art do not know "how to make" or "how to practice" the full scope of Applicants' claims.

The Examiner further states at page 17 of Office Action dated 07/28/2004:

> The applicants assert that the "Examiner has not shown by evidence not contained within applicants' teaching that the art of high T_c superconductors is unpredictable in view of applicants' teaching" (spelling and punctuation errors corrected). To the extent that the same assertion is understood, the rejection is maintained for the reasons of record.

Applicants' statement is very clear. The Examiner is trying to avoid the issue since the Examiner has not shown by evidence not contained within Applicants' teaching that the art of high T_c superconductors is unpredictable within the meaning of the U.S. Patent law. The Examiner has merely **"deemed"** it to be so for which there is no cited authority for an Examiner to be permitted to do this.

The Examiner further states at page 17 of Office Action dated 07/28/2004:

> The applicants point to "Copper Oxide Superconductors" by Charles P. Pooler Jr., et al., (hereinafter, "the Poole article") as supporting their position that higher temperature superconductors were not that difficult to make after their original discovery.
>
> Initially however, it should be noted that the Poole article was published after the priority date presently claimed. As such, it does not provide evidence of the state of the art at the time the presently claimed invention was made.

Applicants have extensively referred to "Copper Oxide Superconductors" by Charles P. Poole, Jr., et al., (hereinafter, "the Poole 1988 book" or "the Poole 1988 article") (Brief Attachments AF and AW) as supporting their position that higher temperature superconductors were not difficult to make after their original discovery. This is because methods of making compositions which could be used to practice Applicants' claimed invention were well known prior to Applicants' discovery that ceramic material had a $T_c \geq 26°K$. In response the Examiner states "Initially, however, it should be noted that the Poole article

[Poole 1988 (Brief Attachments AF and AW)] was published after the priority date presently claimed". It is not relevant that Poole 1988 (Brief Attachments AF and AW) was published after the priority date since it is clear evidence that only routine experimentation based on what was known to persons of skill in the art prior to Applicants' discovery was needed to practice Applicants' claimed invention and there is no indication that anything more than Applicants' teaching and what was known prior to Applicants' discovery is needed. This is corroborated by the affidavits of Brief Attachments AH to AO, in particular paragraphs 46 of Brief Attachments AM to AO. The Examiner further comments on the Poole 1988 book (Brief Attachments AF and AW) stating, "[a]s such, it does not provide evidence of the state of the art at the time the presently claimed invention was made". As noted Poole 1988 clearly states that the materials that can be used within the scope of Applicants' claims were easily made. And as stated above the Examiner has acknowledged that the fabrication techniques were well known prior to Applicants' invention. Poole 1988 states that is why so much work was done in so short a period of time. This is clear and convincing evidence that persons of skill in the art were fully enabled by Applicants' teaching to practice Applicants' claimed invention prior to their discovery. The CCPA in In re Hogan Supra and the CAFC in In re Wright Supra explicitly permit later publications to corroborate the truth of an applicants' teaching. It is not necessary for Applicants to show that the data was generated prior to Applicants' filing date. The CCPA in In re Angstadt, supra, clear states this is not required. The Examiner has not stated, nor is there any evidence presented by the Examiner, nor is there any indication in the Poole 1988 book that anything more than what Applicants taught was necessary to practice Applicants' claimed invention. It is only necessary that persons of skill in the art can practice Applicants' claimed invention from Applicants' teaching without undue experimentation. As stated in In re Angstadt there is no requirement for Applicants to prove that the experimentation to make compositions to practice Applicants' claimed invention is undue just because some experimentation is

needed to select compositions that come within the scope of the Applicants claims. The Examiner is not applying the standard of In re Angstadt.

The Examiner further states referring to Poole 1988 at page 18 of Office Action dated 07/28/2004:

> Finally, the Preface states in part at A3: "The unprecedented worldwide effort in superconductivity research that has taken place over the past two years has produced an enormous amount of experimental data on the properties of the copper oxide type materials that exhibit superconductivity above the temperature of liquid nitrogen. During this period a consistent experimental description of many of the properties of the principal superconducting compounds such as BiSrCaCuO, LaSrCuO, TlBaCaCuO and YBaCuO has emerged, The field of high-temperature superconductivity is still evolving ..." That preface is deemed to show that the field of high-temperature superconductivity continued to grow, on the basis of on-going basic research, after the Bednorz and Mueller article was published.

The continued growth referred to in the passage from Poole 1988 book (Brief Attachments AF and AW) quoted above does not mean that this work is not based on Applicants' initial fundamental teaching. The Poole 1988 book, as quoted above, states that the unprecedented amount of work done in the short period of time after Applicants' work was because the materials "are not difficult to synthesize." Moreover, as quoted above the CCPA In re Fisher 166 USPQ 1-8, supra, states "such an inventor should be allowed to dominate future patentable inventions of other where those inventors were based on in some way on his teachings." Moreover, the referred to future developments in the passage above are not necessarily patentably distinct from Applicants' teachings. Those who developed these compounds would have a reasonable expectation of success based on Applicants' teaching. The Examiner has provided no evidence to the contrary. Alternatively, as stated above, if such later developments are patentable species within the scope of Applicants' claims, under In re Fisher Supra and In re Knowlton Supra, such applicant is entitled to patent to such

species. Individual compositions fabricated and tested based on Applicants' teaching may be separately patentable species within the scope of Applicants' generic claims because of unexpected results. But, that issue is not under review here. Moreover, the Poole 1988 preface states, "during this period a consistent experimental description of many of the properties of the principal superconducting compounds such as BiSrCaCuO, LaSrCuO, TlBaCaCuO and YBaCuO has emerged." Poole 1988 is clearly stating that "a consistent experimental description ... has emerged", that is consistent with applicants original description in their publication (Brief Attachment AX), based on which they received the Nobel prize.

The first (BiSrCaCuO) and third (TiBaCaCuO) of these compositions referred to by the Examiner in the passage above does not come within the scope of the claims allowed by the Examiner since they do not contain a rare earth or group III B element, even though Poole 1988 states that they are easy to make following the general principals of ceramic science as taught by Applicants. As stated above to satisfy the enablement requirement Applicants are not required to foresee all species that come within the scope of Applicants' claims. Moreover, Poole 1995 (Brief Attachment Z) described below and in paragraph 23-25 of the Newns Affidavit (Brief Attachment AP) and in paragraph 47 of the DST AFFIDAVITS (Brief Attachments AM to AO) state that these compositions are "metallic, oxygen-deficient ... perovskite-like, mixed valence copper compounds" as Applicants' described them to be in Applicants' Article (Brief Attachment AX).

Other data supporting Applicants' view is reported in the Review Article "Synthesis of Cuprate Superconductors" by Rao et al., IOP Publishing Ltd. 1993. (The Rao Article) A copy of this article is in Brief Attachment AB. This article lists in Table 1 the properties of 29 superconductors made according to Applicants' teaching. Twelve (#'s 1, 8-13, 16, 17, 20, 21, 27 and 28) of those listed do not come within the scope of the claims allowed by the Examiner. Only

three of the 29 have a T_c < 26°K. Those twelve do not contain one or more of a rare earth, a group III B element or an alkaline earth element. It is thus clear that broader claims than presently allowed should be allowed since it is clear that the allowed claims can be avoided following Applicants' teaching without undue experimentation. As stated in In re Fisher supra, Applicants are entitled to claims which encompass these materials since they were made following Applicants' teaching.

The article of Rao et al. (Brief Attachment AB) in the first sentence of the introduction citing Applicants' article (Brief Attachment AX) - which is incorporated by reference in the application under appeal at page 6 - acknowledges that Applicants initiated the field of high T_c superconductivity. Applicants further note that the Rao article acknowledges that "a large variety of oxides" are prepared by the general principles of ceramic science and that Applicants discovered that oxides are high T_c superconductors.

The Rao article cites reference 5 therein - the book "New Directions in Solid State Chemistry", Rao et al. 1989 (Cambridge; Cambridge University Press) for which there is a 1986 edition which predates Applicants' filing date (Brief Attachment AB), The Rao article states at page1, first paragraph of left column:

> Several methods of synthesis have been employed for preparing cuprates, with the objective of obtaining pure monophasic products with good superconducting characteristics [3, 4]. The most common method of synthesis of cuprate superconductors is the traditional ceramic method which has been employed for the preparation of a large variety of oxide materials [5]. Although the ceramic method has yielded many of the cuprates with satisfactory characteristics, different synthetic strategies have become necessary in order to control factors such as the cation composition, oxygen stoichiometry, cation oxidation states and carrier concentration. Specifically noteworthy amongst these methods are chemical or solution routes which permit better mixing of the constituent cations in order to reduce the diffusion distance in

> the solid state [5, 6]. Such methods include coprecipitation, use of precursors, the sol-gel method and the use of alkali fluxes. The combustion method or self-propagating high-temperature synthesis (SHS) has also been employed.

Reference 5 of the Rao et al., article is another example of a reference to the general principles of ceramic science incorporated into Applicants' teaching. The Rao et al. article states that the 29 materials reported on in the article and listed in Table 1 thereof are fabricated using the general principles of ceramic science. Moreover, the Rao article states that these materials are fabricated by what the Rao article calls the "ceramic method" which is the preferred embodiment in Applicants' specification, yet 12 of the 29 materials in Table 1 do not come within the scope of the claims allowed by the Examiner. Thus known examples fabricated according to Applicants' teaching will not literally come within the scope of the claims so far allowed to Applicants. All 29 materials of Table 1 are fabricated through experimentation, i.e., without undue experimentation as shown in the affidavits in Brief Attachments AH, AI, AJ, AK, AL, AM, AN and AO and Poole 1988 (Brief Attachments AF and AW) Poole 1995 (Brief Attachment W) Poole 1996 (Brief Attachment AG) and the Rao article (Brief Attachment AB).

The Examiner further states at page 18-20 of Office Action dated 07/28/2004:

> The applicants submitted three affidavits, one each from Drs. Tsuei, Dinger and Mitzi which were signed in May of 1998. Except for one change, those three affidavits are the same as the ones submitted before and discussed above.
>
> Those affidavits have been changed to indicate that the present application "includes all known principles of ceramic fabrication known at the time the application was filed."
>
> However, the additional indication also is considered to be a conclusory statement unsupported by particular evidence.

As discussed below with the Applicants' response to the Office Action dated 07/28/2004 applicants have submitted five affidavits of Dinger, Shaw and Tsuei (Brief Attachments AH, AI, AJ, AK and AL) extensive showing of documentary evidence of facts known prior to applicants' discovery. These affidavits conclusively show that once Applicants discovery is known undue experimentation is not necessary to practice Applicants' invention to the full scope of the claims.

The Examiner further states at page 19 of Office Action dated 07/28/2004:

> Application have submitted three affidavits attesting to the applicants' status as the discoverers of materials that superconduct > 26°K. Each of the affidavits states that "all the high temperature superconductors which have been developed based on the work of Bednorz and Mueller behave in a similar manner (way)". Each of the affidavits add "(t)hat once a person of skill in the art knows of a specific transition metal oxide composition which is superconducting above 26°K, such a person of skill in the art, using the techniques described in the (present) application, which includes all known principles of ceramic fabrication, can make the transition metal oxide compositions encompassed by (the present) claims ... without undue experimentation or without requiring ingenuity beyond that expected of a person of skill in the art.
>
> It is the Examiner's maintained position that while general principles of ceramic fabrication were most certainly known prior to the filing date of the instant application, the utilization of such techniques to produce superconductive materials within the scope of the instant claims were not known. The affidavits are not effective to demonstrate enablement at the time the invention was made. As stated in paper #66, page 8, one may now know of a material that superconducts at more than 26°K, but the affidavits do not establish the existence of that knowledge on the filing date of the present application.

When the Examiner made this statement in the Office Action dated 07/28/2004 Applicants had submitted five (not three) affidavits (Brief Attachments AH, AI, AJ, AK and AL). The Examiner acknowledges that the fabrication techniques necessary to practice Applicants' invention were known

prior to the filing dated of the present application. But, the Examiner further states that the "utilization of such techniques to produce superconductive materials within the scope of the instant claims were not known". The scope of the instant claims is an apparatus for flowing a superconductive current in a composition having a $T_c \geq 26°K$. That is Applicants' discovery. That is why it was not known prior to Applicants' discovery. How to make this type of material was known prior to Applicants' discovery. As described in detail below in Applicants' first filed application 07/053,307 Applicants' claims were directed to compositions of matter having high Tc properties. These claims were rejected under 35 USC 102 as being inherent over prior art. Thus it is incorrect for the Examiner to say in regards to known principals of ceramic fabrication "utilization of such techniques to produce superconductive materials within the scope of the instant claims was not known." It is true that these materials were not previously made with the intent to use them as superconductors. This statement of the Examiner is inconsistent with the Examiner's earlier rejection for inherency. Prior to Applicants' discovery, It was not known that they were superconductive with a $T_c \geq 26°K$. The Examiner incorrectly states "one may now learn of a material that superconducts at more than 26°K, but the affidavits do not establish the existence of that knowledge on the filing date of the present invention." If that knowledge was known by another prior to discovery, Applicants would not have a patentable invention since they would not be the initial first and sole inventor. Moreover, according to the CCPA in In re Angstadt Supra, In re Cook Supra and In re Fisher Supra, Applicants' teaching does not have to teach in advance all examples that come within the scope of their claims. See In re Angstadt Factor 7 and 8 above, In re Cook Super and In re Fisher Supra. The affidavits state that the knowledge of how to make compositions within the scope of Applicants' claims, such as oxides made by the general principles of ceramic science was known prior to the Applicants' discovery. In particular, the affidavits of Mitzi, Dinger, Tsuei, Shaw and Duncombe (Brief Attachments AH, AI, AJ, AK and AL) refer to a number of articles and texts on the general principles of ceramic science. One of these texts is "Structures, Properties and Preparation of

Peroskite-type Compounds", F.S. Galasso (1969). (Brief Attachment E) The additional affidavits in Brief Attachments AM to AO provide extensive detail on how to fabricate samples according to applicants teaching.

As stated above Applicants note that Poole 1988 (Brief Attachments AF and AW) support their position that high temperature superconductors were not difficult to make after their original discovery. The Poole 1988 book was published after Applicants' initial discovery which was published in Applicants' article (Brief Attachment AX). The Examiner states "[a]s such, it does not, provide evidence of the state of the art at the time the presently claimed invention was made".

Applicants disagree. The preface of the Pool 1988 book (Brief Attachments AF and AW) says "[t]his volume reviews the experimental aspects of the field of oxide superconductivity with transition temperatures from 30K to above 123K, from the time of its discovery by Bednorz and Muller in April, 1986 until a few months after the award of the Nobel Prize to them in October, 1987." Thus the book reports on work done within eighteen months of Applicants' discovery in April 1986 and within eleven months of its publication in September, 1986. This passage is referring to Applicants and Applicants' article (Brief Attachment AX) referred to at page 6 of Applicants' specification. This book acknowledges that Applicants are the discovers of the field of high temperature superconductivity and that persons of skill in the art can make species of high Tc material useful to practice Applicants claims. The Examiner's view that the skill of the art was insufficient at the time of the filing date of the present application is untenable in the view of Poole 1988, Poole 1995, Poole 1996 (Brief Attachments AF, AW, W and AG), and Applicants' 132 affidavits of Tsuei, Mitzi, Shaw, Dinger and Duncombe, (Brief Attachments AH, AI, AJ, AK and AL) in particular that of Peter Duncombe (Brief Attachment AL) which reports data prior to the Applicants' filing date and in addition in view of the extensive affidavits of Dinger, Shaw and Tsuei (The DST AFFIDAVITS Brief Attachments AM, AN and AO).

Applicants note that it is generally recognized that it is not difficult to fabricate high T_c materials, in particular oxides, more particularly transition metal oxides and more particularly copper oxides that are superconductive after the discovery by Applicants of composition. Chapter 5 of the Poole 1988 book (Brief Attachments AF and AW) entitled "Preparation and Characterization of Samples" states at page 59 "[c]opper oxide superconductors with a purity sufficient to exhibit zero resistivity or to demonstrate levitation (Early) are not difficult to synthesize. We believe that this is at least partially responsible for the explosive worldwide growth in these materials". Poole 1998 further states at page 61 "[i]n this section three methods of preparation will be described, namely, the solid state, the coprecipitation, and the sol-gel techniques (Hatfi). The widely used solid-state technique permits off-the-shelf chemicals to be directly calcined into superconductors, and it requires little familiarity with the subtle physicochemical process involved in the transformation of a mixture of compounds into a superconductor." The Poole 1988. further states at pages 61-62 "[i]n the solid state reaction technique one starts with oxygen-rich compounds of the desired components such as oxides, nitrates or carbonates of Ba, Bi, La, Sr, Ti, Y or other elements. ... These compounds are mixed in the desired atomic ratios and ground to a fine powder to facilitate the calcination process. Then these room-temperature-stabile salts are reacted by calcination for an extended period (~20hr) at elevated temperatures (~900°C). This process may be repeated several times, with pulverizing and mixing of the partially calcined material at each step." This is generally the same as the specific examples provided by Applicants and as generally described at pages 8, line 19, to page 9, line 5, of Applicants' specification which states "[t]he methods by which these superconductive compositions can be made can use known principals of ceramic fabrication, including the mixing of powders containing the rare earth or rare earth-like, alkaline earth, and transition metal elements, coprecipitation of these materials, and heating steps in oxygen or air. A particularly suitable superconducting material in accordance with this invention is one containing

copper as the transition metal." Consequently, Applicants have fully enabled high T_c materials and their claims.

As stated in the affidavit of (Brief Attachments AH to AO) the preface of the book by Poole 1988, quoted above, the work of Applicants initiated the field of high temperature superconductors and these materials are not difficult to synthesize. And according In re Fisher "it is apparent that such an inventor should be allowed to dominate future patentable inventions of others where those inventions were based in some way on his teaching." (166 USPQ 18, 24)

The Examiner further states at page 20 of Office Action dated 07/28/2004:

> A key issue that can arise when determining whether the specification is enabling is whether the starting materials or apparatus necessary to make the invention are available. In the biotechnical area, this is often true when the product or process requires a particular strain of microorganism and when the microorganism is available only after extensive screening. The Court in In re Ghiron, 442 F.2d 985, 991, 169 USPQ 723, 727 (CCPA 1971), made clear that if the practice of a method requires a particular apparatus, the application must provide a sufficient disclosure of the apparatus if the apparatus is not readily available. The same can be said if certain chemicals are required to make a compound or practice a chemical process. In re Howarth, 654 F.2d 103, 105, 210 USPQ 689, 691 (CCPA 1981).
>
> The Examiner respectfully maintains, for the reasons of record, that the disclosure is not fully enabling for the scope of the present claims.

The Examiner cites In re Ghiron, 169 USPQ 723, 727 stating In re Ghiron "made it clear that if practice of a method requires a particular apparatus, the application must provide a sufficient disclosure of the apparatus if the apparatus is not readily available." No special apparatus is needed to practice Applicants' claimed invention since the apparatus was readily available before Applicants' discovery. The Examiner cites no evidence to the contrary. For example, see "Theory of Superconductivity" M. Von Laue, Academic Press, Inc., 1952 (Brief

Attachment AT) in which is shown that an apparatus to flow a superconducting current in a material at a temperature less than the T_c of the material was well known in 1952 and from the affidavits of Brief Attachments AH to AO in particular The DST AFFIDAVITS (Brief Attachments AM, AN and AO) and Poole 1988 (Brief Attachments AF and AW) apparatus to make ceramic materials was well known prior to Applicants' discovery.

The Examiner citing In re Howarth 210 USPQ 689, 691 states "The same can be said if certain chemicals are required to make a compound or practice a chemical process." Firstly, the claims of the present invention are not directed to a chemical process. In re Howarth at 210 USPQ 689, 692, The United States Supreme Court citing Webster v. Higgins 105 US 580, 586 states an applicant "may begin at the point where his invention begins, and describe what he has made that is new and what it replaces of the old. That which is common and well known is as if it were written out in the patent and delineated in the drawings." In the present invention how to create a superconducting current was well known in the art before Applicants' discovery. The process for making the compounds through which the apparatus of Applicants' claims carry the superconducting current is not new but well know prior to Applicants' discovery. What is new is Applicants' discovery that materials exist having a $T_c \geq 26°K$. This is what Applicants are claiming, their discovery of an apparatus carrying a superconductive current with a $T_c \geq 26°K$. In re Howarth states at 210 USPQ 689, 691 "an inventor need not ... explain every detail since he is speaking to those skilled in the art. What is conventional knowledge will be read into the disclosure." The Examiner has not shown what information is missing from Applicants' specification that is not known to person of skill in the art prior to Applicants' discovery that is necessary for a person of skill in the art to practice Applicants' claimed invention. Specific examples that are not specifically identified in Applicants' specification that have $T_c \geq 26°K$ that can be made according to Applicants' teaching are enabled according to the CCPA in In re Angstadt, supra, In re Cook Super and In re Fisher Supra.

REMARKS IN REGARD TO REJECTIONS OVER THE ASAHI SHINBUM ARTICLE

Claims 1, 12-31, 33-38, 40-46, 55-59, 64, 69-72, 77-81, 84-86, 91-96, 103, 109, 111-116, 119, 120 and 124 were rejected at page 16 of the Office Action dated July 30, 1998 as obvious over the Asahi Shinbum Article (Brief Attachment AV). Only claim 123 was allowed in that Office Action. (A similar rejection at page 10 of Office Action dated 05/27/97) Since this was a rejection for obviousness over a single reference, this means that a person of ordinary skill in the art, according to the Examiner, was enabled to practice the claimed inventions of the rejected claims from the teaching of the Asahi Shinbum article and what is generally known to a person of ordinary skill in the art. The claims rejected over the Asahi Shinbum Article were genic to the species of claims 123 allowed over the Asahi Shinbum Article. The Examiner's rejection of claims for lack of enablement is inconsistent with the obviousness rejection over the Asahi Shinbum Article. The Examiner states at page 17 of the Office Action dated 07/30/1998 and at page 11-12 of the Office Action dated 05/27/1997 "based on the teachings of Asahi Shinbum article as a whole, it would have been obvious to one of such skill because that reference teaches superconductivity in an oxide compound of La and Cu with Ba having a structure of the so-called perovskite structure". In the Office Action dated 07/30/1998 claim 123 was allowed over the Asahi Shinbum article because it showed criticality of the formula recited in this claim. For a single reference to be prior art under 35 USC 102 or 103 it is subject to the statutory provisions of 35 USC 112, first paragraph, that is it must enable a person of skill in the art to practice the claimed invention it is alleged to anticipate or render obvious. By the Examiner stating that claim 123 was allowed because it showed criticality of the formula recited, the Examiner is stating that this is a patentably distinct species because of unexpected results of the genius of the Ashai Shinbum Article. (The genus of the Asahi Shinbum Article is Applicants' teaching)

Applicants acknowledge the withdrawal of the prior art rejection over Asahi Shinbum, International Satellite Edition (London), November 28, 1986 (hereinafter, "the Asahi Shinbum article") in view of the remarks in Applicants' prior responses. The Examiner states at page 2 of the Office Action dated 07/28/2004, "Applicant has sufficiently demonstrated conception, diligence and reduction to practice of the instant invention before the publication date of the Asahi Shinbum article." Applicants respectfully submit that the Examiner has not withdrawn the rejection but has found the rejection moot by Applicant swearing behind the date of the Asahi Shinbum Article, in view of the fact that the Examiner has agreed that Applicant has sufficiently demonstrated conception before the publication date of the Asahi Shinbum article in the United States and diligence to a reduction to practice of the instant invention.

The Examiner has not commented on nor rebutted Applicants' argument that in rejecting claims under 35 USC 103 over the Asahi Shinbum article, the Examiner necessarily concludes that Applicants' claims are fully enabled. The Asahi Shinbum article (Brief Attachment AX) refers to Applicants' work which was reported in their original article which is incorporated by reference in Applicants' specification at page 6.

Since Applicants' original article is the only information enabling the Asahi Shinbum article, it logically follows that the Examiner necessarily concludes in the 103 rejection that all Applicants' claims are fully enabled.

Thus in the Office Action of 7-30-98, the Examiner is effectively stating that everything within Applicants' non-allowed claims rejected under 35 USC 103 over the Asahi Shinbum article alone can be practiced by a person of skill in the art with what is taught in the Asahi Shinbum article in combination with what is known to a person of skill in the art. All of Applicants' claims rejected over the Asahi Shinbum article are dominant to (or generic to) the one claim, claim 123, allowed in the Office Action of 7-30-98. Thus by stating that all the non-allowed

claims are obvious over the Asahi Shinbum article alone, the Examiner is stating that a person of skill in the art needs nothing more that what is taught in the Asahi Shinbum article or what is taught therein in combination with what is known to a person of skill in the art to practice that part of each of Applicants non-allowed claims which does not overlap allowed claim 123. Thus, it logically follows from the 35 USC 103 rejections that all of Applicants' claims are fully enabled since the Asahi Shinbum Article is enabled only through Applicants' Article. The English translation of the Ashai Shinbum Article is page 2 of Brief Attachment AV.

The Asahi Shinbum article states in the first paragraph:

> A new ceramic with a very high T_c of 30K of the superconducting transition has been found. The possibility of high T_c - superconductivity has been reported by scientists in Switzerland this spring. The group of Prof. Shoji TANAKA, Dept. Appl. Phys. Faculty of Engineering at the University of Tokyo confirmed in November, that this is true.

and in the second paragraph:

> The ceramic newly discovered, is an oxide compound of La and Cu with Barium which has a structure of the so-called perovskite and shows metal-like properties. Prof. Tanaka's laboratory confirmed that this material shows diamagnitism (Meisner effect) which is the most important indication of the existence of superconductivity.

The Swiss scientist are the inventors (Applicants) of the present application. Thus this clearly refers to Applicants' work which was reported in Applicants' article (Brief Attachment AX) which is incorporated by reference in the present application at page 6 thereof. These passages say that Prof. Tanaka confirmed Applicants' work. The newly discovered ceramic referred to in the article is the ceramic reported on in Applicants' article. It is thus clear that for the Examiner to have rejected Applicants' claim over the Asahi Shinbum article

under 35 USC 103, the Examiner necessarily had to find that Applicants' article fully enabled their claims.

In the Office Action dated 07/30/2004, the Examiner has not commented on nor rebutted these arguments which are in Applicants' prior responses, included in the Fifth Supplementary Amendment dated March 1, 2004. The Examiner, therefore, must be taken to agree with Applicants argument in the prior response that their teaching has fully enabled all of their claims.

At the beginning of Applicants' arguments in the Fifth Supplementary Amendment dated March 1, 2004, in regard to the objections and rejection based on 35 USC 112, first paragraph, Applicants' have repeated these arguments, that is that the 35 USC 103 rejections over the Asahi Shinbum article logically requires that all of Applicants' claims are fully enabled by Applicants' teaching. The Examiner has again not responded nor rebutted them. The Examiner, therefore, must be taken to agree with Applicants argument in the response of March 1, 2004 that their teaching has fully enabled all of their claims.

The Examiners rejections under 35 USC 103 over the Asahi Shinbum articles have been maintained since the Office Action dated August 26, 1992 of the parent application when this rejection was first introduced. Thus the Examiner has maintained the view that all of Applicants' claims are fully enabled for about fourteen years. Thus the specification provides an enabling disclosure of all of Applicants' claims. Applicants note that the Examiner has never withdrawn the rejection of Applicants' claims over the Asahi Shinbum article. Applicants showed that they reduced their invention to practice prior to the publication date of the Asahi Shinbum article. Until the Examiner states that the Asahi Shinbum article is not a reference under 35 USC 102, Applicants' arguments unambiguously show that the Examiner must necessarily be of the view that all of Applicants' claims are fully enabled. As described below the Examiner now appears to state in the Final Action that the Asahi Shinbum Article

is not a reference under 35 USC 102 after stating it was a reference for about 14 years.

In ancestral Application Serial No. 07/875,003, filed 04/24/1992 the Office Action dated 08/26/1992 at page 5 states "Claims 96-108 are rejected under 35 U.S.C. §102(a) as being anticipated by Asahi Shinbum." Claims 69-18, 77-85, 91-95 of App 07/875,003 were apparatus of use claims of the same type currently under appeal, claims 73-76, 88-90 are directed to method of preparing compositions of matter, claims 86-87 and 96-108, are method of operation of a device claims similar to those presently under appeal. By rejecting claims 96-108 as anticipated the Examiner was stating that persons of skill in the art could practice the inventions of those claims from Asahi Shinbum article which is equivalent to stating that those claims are rejected based on Applicants' teaching.

In ancestral Application Serial No. 07/875,003, filed 04/24/1992 in the Office Action dated 11/25/1992 at page 3 (which is a supplemental action to the Office Action dated 08/26/1992) modified this rejection to read claims 24-26 and 86-90 [in addition to claims 96-108] are rejected under 35 USC §102(a) as being anticipated by Asahi Shinbum. Claims 24-26 are method of making composition claims. Claims 86-90 are method of operation of a device claims. Thus the Examiner necessarily was of the view that a person of skill in the art could fabricate the composition of matter and the method of operating a device based on the Asahi Shinbum Article which is equivalent to saying based on Applicants' teaching.

In ancestral Application Serial No. 08/303,561, filed 09/09/1994 the Office Action dated 03/29/1995 at page 4 states, "Claims 24-26, 86-90 and 96-108 are rejected under 35 USC §102(a) as being anticipated by Asahi Shinbum International Satellite Edition (London), November 11,1986 (hereinafter, 'The Asahi Shinbum article") and at page 5 "claims 24-26, 86-90 and 96-108 are rejected 35 USC §103 as being unpatentable over the Asahi Shinbum article."

In ancestral Application Serial No. 08/303,561, filed 09/09/1994 the Office Action dated 05/24/1997 states at page 13 "Claims 24-26, 86-90 and 96-128 are rejected under 35 USC §102(a) as being anticipated by Asahi Shinbum International Satellite Edition (London), November 11,1986 (hereinafter, 'The Asahi Shinbum article") and at page 17 states "Claims 24-26, 86-90 and 96-128 are rejected 35 USC §103 as being unpatentable over the Asahi Shinbum article."

In ancestral Application Serial No. 08/303,561, filed 09/09/1994 the Office Action dated 06/25/1998 states at page 16 "Claims 24-26, 86-90 and 96-135, 137-142 are rejected under 35 USC §102(a) as being anticipated by Asahi Shinbum International Satellite Edition (London), November 11,1986 (hereinafter, 'The Asahi Shinbum article,'" and at page 17 states "Claims 24-26, 86-90 and 96-135 and 137-142 are rejected 35 USC §103 as being unpatentable over the Asahi Shinbum article."

In the present application the Office Action dated 05/27/1997 state at page 10, "claims 1, 12-31, 33-38, 40-46, 55-59, 64, 69-72, 77-81, 84-86, 91-96 and 103 are rejected 35 USC §103 as being unpatentable over the Asahi Shinbum, International Satellite Edition (London), November 11,1986 (hereinafter, 'The Asahi Shinbum article')."

In the present application the Office Action dated 07/30/1998 at page 10, states "claims 1, 12-31, 33-38, 40-46, 55-59, 64, 69-72, 77-81, 84-86, 91-96, 103, 109, 111-116, 119, 120 and 124 are rejected under 35 USC §103(a) as being unpatentable over the Asahi Shinbum article."

In the present application in Office Action dated 02/02/2000 at page 3 the rejection of Applicants' claims over the Asahi Shinbum article was withdrawn when by the Examiner stated, "applicant has sufficiently demonstrated

conception, diligence and reduction to practice of the instant invention before the publication dated of the Asahi Shinbum Article."

In the present application the Examiner has never withdrawn the 35 USC 103 rejection over the Asahi Shinbum Article because it was found not to be a reference under 35 USC 102. Thus as stated above, in the present application the Examiner must necessarily be viewed as having made a finding of fact that Applicants claims are enabled.

Applicants arguments for why the Asahi Shinbum article is not a reference is found at pages 12-34 of the Applicants' paper entitled "Supplementary Response" dated 08/02/1999 (received by USPTO 08/05/1999) in response to the Office Action dated 07/30/1998. In the last paragraph of page 14 of that response Applicants argued that the Asahi Shinbum Article was not a reference under 35 USC 102 or 103 stating:

> [T]he Asahi Shinbum Article provides no teaching of how to make (SIC) the "new ceramic". A reference which does not provide a method of making a composition cannot anticipate a claim to a composition. Also, the Asahi Shinbum article has no specific embodiment of the new composition. Thus it cannot anticipate under 35 USC 112 and thus applicants non allowed claims cannot be obvious under 35 USC 103(a).

This argument was not accepted by the Examiner. At page 3 of the Office Action dated 02/04/2000 the Examiner withdrew the rejections over Asahi Shinbum Article because "applicant has specifically demonstrated conception, diligence and reduction to practice before the publication date of the Asahi Shinbum article." Applicants evidence for swearing behind the Asahi Shinbum Article appears at pages 34-46 of Applicants response dated 08/02/1999.

REMARKS CITING PORTIONS OF THE FILE HISTORY

Claims of the present application have been rejected as not enabled under 35 U.S.C. 112, first paragraph. Applicants disagree for the reasons previously noted. Applicants in addition point out the following.

The present application is a Continuation of 08/060,470 filed on 05/11/93, which is a Continuation of 07/875,003 filed on 04/24/92, which is a Divisional of 07/053,307 filed on 05/22/87 all now abandoned.

In the 07/053,307 ancestral application composition of matter claims where presented for examination. A copy of the Final Rejection referred to below in this application is in Brief Attachment AR.

In the 07/053,307 ancestral application composition of matter, claims 1 through 11 inclusive, 27 through 35 inclusive, 40 through 54 inclusive, 60 through 63 inclusive, and 65 through 68 were finally rejected under 35 U.S.C. 102(b) or in the alternative under 35 U.S.C. 103 as unpatentable over each of a publication by Shaplygin et al. in the Russian Journal of Inorganic Chemistry, volume 24, pages 820-824 (1979) ("the Shaplygin et al. publication"); a publication by Nguyen et al. in the Journal of Solid State Chemistry, volume 39, pages 120-127 (1981) ("the Nguyen et al. publication"); a publication by Michel et al. in the Materials Research Bulletin, volume 20, pages 667-671 (1985) ("the 1985 Michel et al. publication"); and a publication by Michel and Raveau in the Revue de Chimie Minerale, volume 21, pages 407-425 (1984) ("the 1984 Michel and Raveau publication"). See the final rejection dated 4-25-1991 in the 07/053,307 ancestral application.

In the 07/053,307 ancestral application, claims 1, 2, 5 through 11 inclusive, 40 through 44 inclusive, 46, 48, 51 through 54 inclusive, 60, 62, and 66 were finally rejected under 35 U.S.C. 102(b) or in the alternative under 35 U.S.C.

103 as unpatentable over a publication by Perron-Simon et al. in C. R. Acad. Sc. Paris, volume 283, pages 33 through 35 (12 July 1976) ("the Perron-Simon et al. publication"); a publication by Mossner and Kemmler-Scak in the Journal of the Less-Common Metals, volume 105, pages 165 through 168 (1985) ("the Mossner and Kemmler-Sack publication"), a publication by Chincholkar and Vyawahare in Thermal Analysis 6th, volume 2, pages 251 through 256 (1980) ("the Chincholkar and Vyawahare publication"); a publication by Ahmad and Sanyal in Spectroscopy Letters, volume 9, pages 39 through 55 (1976) ("the Ahmad and Sanyal publication"); a publication by Blasse and Corsmit in the Journal of Solid State Chemistry, volume 6, pages 513 through 518 (1973) ("the Blasse and Corsmit publication"); United States Patent No. 3,472,779 to Kurihara et al. ("the Kurihara et al. '779 patent"); a publication by Anderton and Sale in Powder Metallurgy No. 1, pages 14 through 21 (1979) ("the Anderton and Sale publication"). (See the final rejection dated 4-25-1991).

In the 07/053,307 ancestral application the Examiner asserted that the cited references appeared to disclose materials, which inherently provided superconductive properties and consequently therefore, rendered the claims unpatentable. Applicants rebutted the Examiner's reasons for rejection based on limitations in the claims directed to Applicants' new discovery of the superconductive properties of these materials. The rejections was maintained over these arguments.

The claims of the present application are directed to apparatus for flowing a superconducting current in a superconductive composition of matter having a transition temperature greater than or equal to 26 K. This is Applicants' discovery for which they received the 1987 Nobel Prize in Physics. The Examiner in the 07/053,307 ancestral application stated by the 35 U.S.C. 102 and 103 rejections therein that persons of skill in the art knew how to make the compositions of matter based on the references cited therein. In that same final rejection (dated 4-25-91) the Examiner states at page 4 thereof in regard to the

materials described in the cited references "these materials appear to be identical to those presently claimed except that the superconductive properties are not disclosed." Applicants discovered the superconductive properties and in the present application are claiming apparatus using this property. Thus, by the Examiner's reasoning all of the present claims are fully enabled because the Examiner has stated that the compositions of matter recited in the claims can be made with the knowledge of a person of skill in the art prior to Applicant's discovery. Thus the Examiner, in the 07/053,307 ancestral application, agrees with the Applicants' Arguments and the Affidavits of Shaw, Duncombe, Tsuei, Dinger and Mitzi (Brief Attachments AH, AI, AJ, AK and AL) and The DST AFFIDAVITS Brief Attachments AM, AN and AO) submitted by Applicants in support of their position that all their claims are enabled. In view thereof, Applicants respectfully request the Board to reverse the rejection of the claims under 35 U.S.C. 112, first paragraph as not enabled.

Applicants' invention is a pioneering invention. "The Supreme Court in Westinghouse v. Boyden Power Brake Co., 170 U.S. 537, 562 (1898), characterized a pioneering invention as "a distinct step in the progress of the art, distinguished from a mere improvement or perfection of what had gone before." Texas Instruments ICC 6 USPQ 2d 1886 (CAFC 1988). Applicants received the 1987 Nobel Prize in Physics for there discovery of superconductivity at T_c greater that or equal to 26ºK which is about 8 ºK higher than the highest T_c previously known. Even though others following Applicants' teaching identified compositions having T_c more than 100K greater than 26K, only Applicants have received a Nobel Prize for this subject matter. This is because the others followed Applicants' teaching to identify these other compositions.

Applicants respectfully request the Board to withdraw the rejections for lack of enablement of claims under 35 USC 112, first paragraph.

EVIDENCE FROM THE HANDBOOK OF CHEMISTRY AND PHYSICS

In Brief Attachments AC and BB there is a Table of high Tc materials form the "CRC Handbook of Chemistry and Physics" 2000-2001 Edition. There are a total of 48 materials listed in Table 1 of which 21 (those marked with an asterisk in the table in Brief Attachment BB numbers 1, 7-13, 16-18, 20, 21, 27, 28, 30, 31 and 41-44) do not contain one or more of a rare earth, a group III element or an alkaline earth element. Yet all 42 are made according to the general principals or ceramic science taught by Applicants. Two of the 42 materials have a Tc of 25k. Thus a person of skill in the art following applicants' teaching can fabricate materials which avoid the claims allowed by the Examiner but not the claims not allowed by the Examiner.

Table 1 in Brief Attachments AC or BB list at the top 7 references as the source of the information on the 42 high Tc materials. Those references are listed below. For references 1-5 Brief Attachments BC, BD, BE, BF, BG, BH and BI, contain the title page and table of contents of the corresponding books. References 6 and 7 are articles, copies of which are in Brief Attachments BH and BI respectively.

1. Brief Attachment BC
Ginsburg, D.M., Ed., Physical Properties of High-Temperature Superconductors, Vols. 1-111, World Scientific, Singapore, 1989-1992.

2. Brief Attachment BD
Rao, C.N.R., Ed., Chemistry of High-Temperature Superconductors, World Scientific, Singapore, 1991.

3. Brief Attachment BE
Shackelford, J.F., The CRC Materials Science and Engineering Handbook, CRC Press, Boca Raton, 1992, 98-99 and 122-123.

4. Brief Attachment BF
Kaldis, E., Ed., Materials and Crystallographic Aspects of HTc-Superconductivity, Kluwer Academic Pub., Dordrecht, The Netherlands, 1992.

5. Brief Attachment BG
Malik, S.K. and Shah, S.S., Ed., Physical and Material Properties of High Temperature Superconductors, Nova Science Pub., Commack, N.Y., 1994.

6. Brief Attachment BH
Chmaissen, O., et al., Physica C230, 231-238, 1994.

7. Brief Attachment BI
Antipov, E.V., et al., Physica C215, 1-10, 1993. 231-238, 1994.

Copies of the entire books corresponding to Brief Attachment BC, BD, BE, BF, and BG were submitted in the present application and are identified as artifacts indicted in the Advisory Action dated 08/14/2006.

THEORY NOT REQUIRED FOR ENABLEMENT

As stated in Applicants' prior responses the basic theory of superconductivity has been known many years before Applicants' discovery. Notwithstanding, Applicants do not have to theoretically understand their invention to be entitled to claims that cover their teaching. The Examiner is confusion “scientific theory” with the patent law legal term “predictable or unpredictable art.” As stated above the patent law legal term “predictable or unpredictable art” relates to the language of 35 USC 112, first paragraph, “how to make” and “how to practice”. This will be referred to herein as “how-to-make/how-to-practice predictability”. A scientific theory relates to what will be referred to herein as “theoretical predictability”. The broad subject matter of the present application is solid state science. A theory in this subject matter is in the field of solid state physics and chemistry which uses quantum mechanics to construct a mathematical formalism. Such formalism can create a theory that “theoretically predicts” that a particular material can exist and have certain properties, but there may be no known way to fabricate this material. For such a circumstance there would be 100% “theoretical predictability” but no “how-to-make/how-to-practice predictability.” For this situation there would be no enablement under 35 USC 112, first paragraph. On the other hand, there may be no presently existing theory to explain a particular phenomenon so that there is no “theoretical predictability”, but if it is well known how to make the materials and how to use them, then there is “how-to-make/how-to-practice predictability” and the materials are enabled with in the meaning of 35 USC 112 first paragraph. Also, the existence of materials having a Tc less than 26°K does not mean that Applicants have not enabled $Tc \geq 26°K$. As stated in the application's prior responses, the CCPA in In re Angstadt has stated that if the experimentation needed to identify compositions that do not come with the scope of a claim is not "undue experimentation", then the claim is enabled. Also the reference to "a second non-conducting CuO phase" at page 14, line 18, of Applicants' specification does not mean that Applicants have not enabled the claims since

along with this non-conducting phase existed a phase having Tc ≥ 26°K. There is no statutory or decisional law basis for an Examiner "deeming" a patent claim not enabled. The Examiner has the burden of showing that based on Applicants' teaching undue experimentation is need to practice the claimed invention. The Examiner has not meet this burden to establish a prima facia case of nonenablement. As stated above the Board in Ex parte Jackson has stated that claims are enabled if merely routine experimentation is needed to identify species within the scope of Applicants' claims.

In Newman v. Quigg, 877 F.2d 1575, 1581-1582 (Fed. Cir. 1989) 11 U.S.P.Q.2D (BNA) 1340 the CAFC states:

> While it is not a requirement of patentability that an inventor correctly set forth, or even know, how or why the invention works, ... neither is the patent applicant relieved of the requirement of teaching how to achieve the claimed result, even if the theory of operation is not correctly explained or even understood. (Citations omitted)

In In re Isaacs, 52 C.C.P.A. 1791, 1798 (C.C.P.A. 1965) 146 U.S.P.Q. (BNA) 193 the CCPA states:

> We point out in connection with this rejection that an applicant need not understand the theory or scientific principle underlying his invention. In re Storrs, 44 CCPA 981, 245 F.2d 474, 114 USPQ 293. All that an applicant need do is enable a person skilled in the art to duplicate his efforts, and appellants have certainly done so here.
>
> see also Wands, 858 F.2d at 736-37 ("Enablement is not precluded by some experimentation, such as routine screening.").

"Enablement is not precluded by some experimentation, such as routine screening." Wands, 858 F.2d at 736-37. The CAFC agrees with the Board decision in Ex parte Jackson:

> The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of

> guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed. Ex parte Jackson, 217 U.S.P.Q. (BNA) 804, 807 (1982).

An art is predictable if species within the scope of a claim can be determined without undue experimentation, even in the absence of a theory by means of which such species can be determined, if those other species can be determined following the teaching of an applicant in view of what is known to persons of skill in the art by experimentation that is not undue. Guidance is needed "with respect to the direction in which the experimentation should proceed" when more than undue experimentation is needed to make such other species. There is no evidence in the current application that anything other than undue experimentation is needed to determine species that come within the scope of Applicants claims. As described in detail by Dr. Newns' in his affidavit in Brief Attachment AP doing a "physical experiment" to determine a species is essentially the same or equivalent to doing a "theoretical experiment" to determine a species. Thus Applicants claims are fully enabled.

THE DST AFFIDAVITS

In response to the Examiner's statement at the bottom of page 18 of the Office Action of 07/28/2004 in regards to the affidavits Mitzi, Dinger, Tsuei, Shaw and Duncombe of Brief Attachments AH, AI, AJ, AK and AL that are conclusory and unsupported by particular evidence, Applicants submitted the expanded affidavits of Shaw, Dinger, and Tsuei (referred to herein as the DST AFFIDAVITS) (Brief Attachments AM, AN and AO).

1. Paragraph 1 of each DST AFFIDAVIT gives the educational history of each affiant to qualify each affiant as an expert in the ceramic arts.

2. Paragraph 2 of each DST AFFIDAVIT state that it refers to Attachments A to Z and AA which were submitted in a separate paper designated as "FIRST SUPPLEMENTAL AMENDMENT" in response to the Office Action dated July 28, 2004 and to Attachments AB to AG which were submitted in a separate paper designated as "THIRD SUPPLEMENTAL AMENDMENT" in response to the Office Action dated July 28, 2004. The referred to attachments A to Z and AA to AG are identical to Brief Attachments A to Z and AA to AG.

3. Paragraph 3 of each DST AFFIDAVIT provides the work history of each affiant to qualify each as an expert in the ceramic arts.

4. Paragraph 4 of each DST AFFIDAVIT identifies the length of time each affiant has worked in the ceramic arts to qualify each affiant as an expert in the ceramic arts. The Examiner has not denied that any of the Applicants affiants are experts in the ceramic arts.

5. Paragraph 5 of each DST AFFIDAVIT refers to a resume and list of publications is in Attachment 1 included with this affidavit.

6. Paragraph 6 of each DST AFFIDAVIT states that these affidavits in addition to the affidavit submitted earlier. Each of the DST AFFIDAVIT states that the affiant has reviewed the above-identified patent application (Bednorz-Mueller application) and acknowledges that it represents the work of Bednorz and Mueller, which is generally recognized as the first discovery of superconductivity in a material having a $T_c \geq 26°K$ and that subsequent developments in this field have been based on this work.

7. Paragraph 7 of each DST AFFIDAVIT states that all the high temperature superconductors which have been developed based on the work of Bednorz and Mueller behave in a similar manner, conduct current in a similar manner, have similar magnetic properties, and have similar structural properties.

8. Paragraph 7 of each DST AFFIDAVIT states that "once a person of skill in the art knows of a specific type of composition described in the Bednorz-Mueller application which is superconducting at greater than or equal to 26°K, such a person of skill in the art, using the techniques described in the Bednorz-Mueller application, which includes all principles of ceramic fabrication known at the time the application was initially filed, can make the compositions encompassed by the claims of the Bednorz-Mueller application, without undue experimentation or without requiring ingenuity beyond that expected of a person of skill in the art of the fabrication of ceramic materials. This is why the work of Bednorz and Mueller was reproduced so quickly after their discovery and why so much additional work was done in this field within a short period after their discovery. Bednorz and Mueller's discovery was first reported in Z. Phys. B **64** page 189-193 (1996)".

9. Paragraph 9 of each DST AFFIDAVIT states that the techniques for placing a superconductive composition into a superconducting state have been known since the discovery of superconductivity in 1911 by Kamerlingh-Onnes. Thus Applicants have thought "how to use" their claimed invention satisfying this requirement of 35 USC 112, first paragraph.

10. Paragraph 10 of each DST AFFIDAVIT states that prior to 1986 a person having a bachelor's degree in an engineering discipline, applied science, chemistry, physics or a related discipline could have been trained within one year to reliably test a material for the presence of superconductivity and to flow a superconductive current in a superconductive composition. This establishes the level of skill needed to use Applicants' claimed invention.

11. Paragraph 11 of each of the prior to 1986 a person of ordinary skill in the art of fabricating a composition according to the teaching of the Bednorz-Mueller application would have: a) a Ph.D. degree in solid state chemistry, applied physics, material science, metallurgy, physics or a related discipline and have done thesis research including work in the fabrication of ceramic materials; or b) have a Ph.D. degree in these same fields having done experimental thesis research plus one to two years post Ph.D. work in the fabrication of ceramic materials; or c) have a master's degree in these same fields and have had five years of materials experience at least some of which is in the fabrication of ceramic materials. Such a person is referred to herein as a person of ordinary skill in the ceramic fabrication art. Applicants note that their claims are not composition of matter claims, but are directed to an apparatus, device, structure etc. carrying a superconductor current in an element having $T_c \geq 26°K$.

12. Paragraph 12 of each DST AFFIDAVIT states that the general principles of ceramic science referred to by Bednorz and Mueller in their patent application and known to a person of ordinary skill in the ceramic fabrication art can be found in many books and articles published before their discovery, priority date (date of filing of their European Patent Office patent application EPO 0275343A1, January 23, 1987) and initial US Application filing date (May 22, 1987). An exemplary list of books describing the general principles of ceramic fabrication are:

a) Introduction to Ceramics, Kingery et al., Second Edition, John Wiley & Sons, 1976, in particular pages 5-20, 269-319, 381-447 and 448-513, a copy of which is in Attachment B.

b) Polar Dielectrics and Their Applications, Burfoot et al., University of California Press, 1979, in particular pages 13-33, a copy of which is in Attachment C.

c) Ceramic Processing Before Firing, Onoda et al., John Wiley & Sons, 1978, the entire book, a copy of which is in Attachment D.

d) Structure, Properties and Preparation of Perovskite-Type Compounds, F. S. Galasso , Pergamon Press, 1969, in particular pages 159-186, a copy of which is in Attachment E.

These references were previously submitted with the Affidavit of Thomas Shaw submitted December 15, 1998.

13. Paragraph 13 of each DST AFFIDAVIT refers to an exemplary list of articles applying the general principles of ceramic fabrication to the types of materials described in Applicants' specification which are:

a) Oxygen Defect K_2NiF_4 - Type Oxides: The Compounds $La_{2-x}Sr_xCuO_{4-x/2+\cdot}$, Nguyen et al., Journal of Solid State Chemistry 39, 120-127 (1981). See Attachment F.

b) The Oxygen Defect Perovskite $BaLa_4Cu_5\text{-}O_{13.4}$, A Metallic (This is referred to in the Bednorz-Mueller application at page 21, lines 1-2) Conductor, C. Michel et al., Mat. Res. Bull., Vol. 20, pp. 667-671, 1985. See Attachment G.

c) Oxygen Intercalation in Mixed Valence Copper Oxides Related to the Perovskite, C. Michel et al., Revue de Chemie Minerale, 21, p. 407, 1984. (This is referred to in the Bednorz-Mueller application at page 27, lines 1-2). See Attachment H.

d) Thermal Behaviour of Compositions in the Systems x $BaTiO_3$ + (1-x) $Ba(Ln_{0.5}\ B_{0.5})\ O_3$, V.S. Chincholkar et al., Therm. Anal. 6th, Vol. 2., p. 251-6, 1980. See Attachment I.

14. Paragraph 14 of each DST AFFIDAVIT states the Bednorz-Mueller application in the paragraph bridging pages 6 and 7 states in regard to the high T_c materials:

> These compositions can carry supercurrents (i.e., electrical currents in a substantially zero resistance state of the composition) at temperatures greater than 26°K. In general, the compositions are characterized as mixed transition metal oxide systems where the transition metal oxide can exhibit multivalent behavior. These compositions have a layer-type crystalline structure, often perovskite-like, and can contain a rare earth or rare earth-like element. A rare earth-like element (sometimes termed a near rare earth element is one whose properties make it essentially a rare earth element. An example is a group IIIB element of the periodic table, such as La. Substitutions can be found in the rare earth (or rare earth-like) site or in the transition metal sites of the compositions. For example, the rare earth site can also include alkaline earth elements selected from group IIA of the periodic table, or a combination of rare earth or rare earth-like elements and alkaline earth elements. Examples of suitable alkaline earths include Ca, Sr, and Ba. The transition metal site can include a transition metal exhibiting mixed valent behavior, and can include more than one transition metal. A particularly good example of a suitable transition metal is copper. As will be apparent later, Cu-oxide based systems provide unique and excellent properties as high T_c superconductors. An example of a superconductive composition having high T_c is the composition represented by the formula RE-TM-O, where RE is a rare earth or rare earth-like element, TM is a nonmagnetic transition metal, and 0 is oxygen. Examples of transition metal elements include Cu, Ni, Cr etc. In particular, transition metals that can exhibit multi-valent states are

very suitable. The rare earth elements are typically elements 58-71 of the periodic table, including Ce, Nd, etc.

15. Paragraph 15 of each DST AFFIDAVIT states that in the passage quoted in paragraph 14 the general formula is RE-TM-O "where RE is a rare earth or rare earth-like element, TM is a nonmagnetic transition metal, and 0 is oxygen." This paragraph states "Substitutions can be found in the rare earth (or rare earth-like) site or in the transition metal sites of the compositions. For example, the rare earth site can also include alkaline earth elements selected from group IIA of the periodic table, or a combination of rare earth or rare earth-like elements and alkaline earth elements." Thus applicants teach that RE can be something other than an rare earth. For example, it can be an alkaline earth, but is not limited to a alkaline earth element. It can be an element that has the same effect as an alkaline earth or rare-earth element, that is a rare earth like element. Also, this passage teaches that TM can be substituted with another element, for example, but not limited to, a rare earth, alkaline earth or some other element that acts in place of the transition metal.

16. Paragraph 16 of each DST AFFIDAVIT stat that the table in paragraph 18 of each DST AFFIDAVIT is compiled from the Table 1 of the Article by Rao (See Attachment AB) and the Table of high T_c materials from the "CRC Handbook of Chemistry and Physics" 2000-2001 Edition (See Attachment AC). An asterisk in column 5 of the table in paragraph 18 indicates that the composition of column 2 does not come within the scope of the claims allowed in the Office Action of 07/28/2004. The same is true of the Final Rejection.

17. Paragraph 17 of each DST AFFIDAVIT states that each affiant has reviewed the Office Action dated 07/28/2004, which states at page 6 "The present specification is deemed to be enabled only for compositions comprising a transition metal oxide containing at least a) an alkaline earth element and b) a rare-earth element of Group IIIB element." Each DST affiant states that they disagree for the reasons given in each DST AFFIDAVIT.

18. Paragraph 18 of each DST AFFIDAVIT provides the composite table which is:

1	2	3	4	5	6	7
#	**MATERIAL**	**RAO ARTICLE**	**HANDBOOK OF CHEM & PHYSICS**		**ALKALINE EARTH ELEMENT**	**RARE EARTH ELEMENT**
1	$La_2CuO_{4+\square}$	✓	✓	*	N	Y
2	$La_{2-x}Sr_x(Ba_x)CuO_4$	✓	✓		Y	Y
3	$La_2Ca_{1-x}Sr_xCu_2O_6$	✓	✓		Y	Y
4	$YBa_2Cu_3O_7$	✓	✓		Y	Y
5	$YBa_2Cu_4O_8$	✓	✓		Y	Y
6	$Y_2Ba_4Cu_7O_{15}$	✓	✓		Y	Y
7	$Bi_2Sr_2CuO_6$	✓	✓	*	Y	N
8	$Bi_2CaSr_2Cu_2O_8$	✓	✓	*	Y	N
9	$Bi_2Ca_2Sr_2Cu_3O_{10}$	✓	✓	*	Y	N
10	$Bi_2Sr_2(Ln_{1-x}Ce_x)_2Cu_2O_{10}$	✓	✓		Y	Y
11	$Tl_2Ba_2CuO_6$	✓	✓	*	Y	N
12	$Tl_2CaBa_2Cu_2O_8$	✓	✓	*	Y	N
13	$Tl_2Ca_2Ba_2Cu_3O_{10}$	✓	✓	*	Y	N
14	$Tl(BaLa)CuO_5$	✓	✓		Y	Y
15	$Tl(SrLa)CuO_5$	✓	✓		Y	Y
16	$(Tl_{0\square5}Pb_{0\square5})Sr_2CuO_5$	✓	✓	*	Y	N
17	$TlCaBa_2Cu_2O_7$	✓	✓	*	Y	N
18	$(Tl_{0\square5}Pb_{0\square5})CaSr_2Cu_2O_7$	✓	✓	*	Y	N
19	$TlSr_2Y_{0\square5}Ca_{0\square5}Cu_2O_7$	✓	✓		Y	Y
20	$TlCa_2Ba_2Cu_3O_8$	✓	✓	*	Y	N
21	$(Tl_{0\square5}Pb_{0\square5})Sr_2Ca_2Cu_3O_9$	✓	✓	*	Y	N
22	$TlBa_2(Ln_{1-x}Ce_x)_2Cu_2O_9$	✓	✓		Y	Y
23	$Pb_2Sr_2Ln_{0\square5}Ca_{0\square5}Cu_3O_8$	✓	✓		Y	Y
24	$Pb_2(Sr,La)_2Cu_2O_6$	✓	✓		Y	Y
25	$(Pb,Cu)Sr_2(Ln,Ca)Cu_2O_7$	✓	✓		Y	Y
26	$(Pb,Cu)(Sr,Eu)(Eu,Ce)Cu_2O_x$	✓	✓		Y	Y
27	$Nd_{2-x}Ce_xCuO_4$	✓	✓	*	N	Y
28	$Ca_{1-x}Nd_xCuO_2$	✓			Y	Y
29	$Sr_{1-x}Nd_xCuO_2$	✓	✓		Y	Y
30	$Ca_{1-x}Sr_xCuO_2$		✓	*	Y	N
31	$Ba_{0\square6}K_{0\square\square}BiO_3$		✓	*	Y	N
32	$Rb_2C_5C_{60}$		✓	*	N	Y
33	$NdBa_2Cu_3O_7$		✓		Y	Y
34	$SmBaSrCuO_7$		✓		Y	Y
35	$EuBaSrCu_3O_7$		✓		Y	Y
36	$BaSrCu_3O_7$		✓	*	Y	N

37	$DyBaSrCu_3O_7$		✓		Y	Y
38	$HuBaSrCu_3O_7$		✓		Y	Y
39	$ErBaSrCu_3O_7$ (Multiphase)		✓		Y	Y
40	$TmBaSrCu_3O_7$ (Multiphase)		✓		Y	Y
41	$YBaSrCu_3O_7$		✓	*	Y	Y
42	$HgBa_2CuO_2$		✓	*	Y	N
43	$HgBa_2CaCu_2O_6$ (annealed in O_2)		✓	*	Y	N
44	$HgBa_2Ca_2Cu_3O_8$		✓	*	Y	N
45	$HgBa_2Ca_3Cu_4O_{10}$		✓	*	Y	N

19. Paragraph 19 of each DST AFFIDAVIT in referring to the table of paragraph 18 that the first composition, $La_2\ Cu\ O_{4+\partial}$, has the form RE_2CuO_4 which is explicitly taught by Bednorz and Mueller. The ∂ indicates that there is a nonstoichiometric amount of oxygen.

20. Paragraph 20 of each DST AFFIDAVIT point out that the Bednorz-Mueller application teaches at page 11, line 19 to page 12, line 7:

> An example of a superconductive compound having a layer-type structure in accordance with the present invention is an oxide of the general composition RE_2TMO_4 where RE stands for the rare earths (lanthanides) or rare earth-like elements and TM stands for a transition metal. In these compounds the RE portion can be partially substituted by one or more members of the alkaline earth group of elements. In these particular compounds, the oxygen content is at a deficit. For example, one such compound that meets this general description is lanthanum copper oxide La_2CuO_4...

21. Paragraph 21 of each DST AFFIDAVIT point out that at the Bednorz-Mueller application at page 15, last paragraph states "Despite their metallic character, the Ba-La-Cu-O type materials are essentially ceramics, as are other compounds of the $RE_2\ TMO_4$ type, and their manufacture generally follows known principles of ceramic fabrication."

22. Paragraph 22 of each DST AFFIDAVIT note that compound number 27 of the composite table contains Nd and Ce, both rare earth elements. All of the

other compounds of the composite table, except for number 32, have O and one of the alkaline earth elements which as stated above is explicitly taught by applicants. Compound 31 is a BiO_3 compound in which TM is substituted by another element, here Bi, as explicitly taught by Applicants in the paragraph quoted above.

23. Paragraph 23 of each DST AFFIDAVIT note that the rare earth elements are Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu. See the Handbook of Chemistry and Physics 59th edition 1978-1979 page B262 in Appendix A. The transition elements are identified in the periodic table from the inside front cover of the Handbook of Chemistry and Physics in Brief Attachment A.

24. Paragraph 24 of each DST AFFIDAVIT state that the basic theory of superconductivity has been known many years before Applicants' discovery. For example, see the book "Theory of Superconductivity", M. von Laue, Academic Press, Inc., 1952 (Brief Attachment AD).

25. Paragraph 25 of each DST AFFIDAVIT note that in the composite table of paragraph 18, compound numbers 7 to 10 and 31 are Bismuth (Bi) compounds. Compound number 12 to 22 are Thallium (Tl) compounds. Compound numbers 23 to 26 are lead (Pb) compounds. Compounds 42 to 45 are Mercury (Hg) compounds. Those compounds that do not come within the scope of an allowed claims (the compounds which are not marked with an asterisk in column 3 of the composite table) are primarily the Bi, Tl, Pb and Hg compounds. These compounds are made according to the principles of ceramic science known prior to applicant's filing date. For example, Brief Attachments J, K, L, and M contain the following articles:

Attachment J - Phys. Rev. B. Vol. 38, No. 16, p. 6531 (1988) is directed to Thallium compounds.

Attachment K - Jap. Joun. of Appl. Phys., Vol. 27, No. 2, p. L209-L210 (1988) is directed to Bismuth (Bi) compounds.

Attachment L - Letter to Nature, Vol. 38, No. 2, p. 226 (18 March 1993) is directed to Mercury (Hg) compounds.

Attachment M - Nature, Vol. 336, p. 211 (17 November 1988) is directed to Lead (Pb) based compounds.

26. Paragraph 26 of each DST AFFIDAVIT note that the article of Brief Attachment J (directed to Tl compounds) states at page 6531, left column:

> The samples were prepared by thoroughly mixing suitable amounts of Tl_2O_3, CaO, BaO_2, and CuO, and forming a pellet of this mixture under pressure. The pellet was then wrapped in gold foil, sealed in quartz tube containing slightly less than 1 atm of oxygen, and baked for approximately 3 h at N 880C.

Paragraph 26 of each DST AFFIDAVIT state "[t]his is according to the general principles of ceramic science known prior to applicant's priority date."

27. Paragraph 27 of each DST AFFIDAVIT note that the article of Brief Attachment K (directed to Bi compounds) states at page L209:

> The Bi-Sr-Ca-Cu-O oxide samples were prepared from powder reagents of Bi_2O_3, $SrCO_3$, $CaCO_3$ and CuO. The appropriate amounts of powders were mixed, calcined at 800-870C for 5 h, thoroughly reground and then cold-pressed into disk-shape pellets (20 mm in diameter and 2 mm in thickness) at a pressure of 2 ton.cm^2. Most of the pellets were sintered at about 870C in air or in

an oxygen atmosphere and then furnace-cooled to room temperature.

Paragraph 27 of each DST AFFIDAVIT state "[t]his is according to the general principles of ceramic science known prior to applicant's priority date."

28. Paragraph 28 of each DST AFFIDAVIT note that the article of Brief Attachment L (directed to Hg compounds) states at page 226:

> The samples were prepared by solid state reaction between stoichiometric mixtures of $Ba_2CuO_{3+\square}$ and yellow HgO (98% purity, Aldrich). The precursor $Ba_2CuO_{3+\square}$ was obtained by the same type of reaction between BaO_2 (95% purity, Aldrich) and CuO (NormalPur, Prolabo) at 930C in oxygen, according to the procedure described by De Leeuw et al.[6]. The powders were ground in an agate mortar and placed in silica tubes. All these operations were carried out in a dry box. After evacuation, the tubes were sealed, placed in steel containers, as described in ref. 3, and heated for 5 h to reach ~800C. The samples were then cooled in the furnace, reaching room temperature after ~10 h.

Paragraph 28 of each DST AFFIDAVIT states that this is according to the general principles of ceramic science known prior to applicant's priority date.

29. Paragraph 29 of each DST AFFIDAVIT note that the article of Brief Attachment M (directed to Pb compounds) states at page 211, left column:

> The preparative conditions for the new materials are considerably more stringent than for the previously known copper-based superconductors. Direct synthesis of members of this family by reaction of the component metal oxides or carbonates in air or

oxygen at temperatures below 900C is not possible because of the stability of the oxidized $SrPbO_3$-based perovskite. Successful synthesis is accomplished by the reaction of PbO with pre-reacted (Sr, Ca, Ln) oxide precursors. The precursors are prepared from oxides and carbonates in the appropriate metal ratios, calcined for 16 hours (in dense Al_2O_3 crucibles) at 920-980C in air with one intermediate grinding.

Paragraph 28 of each DST AFFIDAVIT state that "[t]his is according to the principles of ceramic science known prior to applicant's priority date."

30. Paragraph 30 of each DST AFFIDAVIT state that "[a] person of ordinary skill in the art of the fabrication of ceramic materials would be motivated by the teaching of the Bednorz-Mueller application to investigate compositions for high superconductivity other than the compositions specifically fabricated by Bednorz and Mueller."

31. Paragraph 31 of each DST AFFIDAVIT note that in Brief Attachment U, there is a list of perovskite materials from pages 191 to 207 in the book "Structure, Properties and Preparation of Perovskite-Type Compounds" by F. S. Galasso, published in 1969, which is Attachment E hereto. This list contains about 300 compounds. Thus, what the term "Perovskite-type" means and how to make these compounds was well known to a person of ordinary skill in the art in 1969, more than 17 years before the Applicants' discovery.

This is clear evidence that a person of skill in the art of fabrication of ceramic materials knows (prior to Applicants' priority date) how to make the types of materials in Table 1 of the Rao Article and the Table from the Handbook of Chemistry and Physics as listed in the composite table above in paragraph 17.

32. Paragraph 32 of each DST AFFIDAVIT note that the standard reference "Landholt-Börnstein", Volumn 4, "Magnetic and Other Properties of Oxides and Related Compounds Part A" (1970) lists at page 148 to 206 Perovskite and Perovskite-related structures. (See Brief Attachment N). Section 3.2 starting at page 190 is entitled "Descriptions of perovskite-related structures". The German title is "Perowskit-änliche Strukturen". The German word "änliche" can be translated in English as "like". The Langenscheidt's German-English, English-German Dictionary 1970, at page 446 translates the English "like" as the German "änliche". (See Brief Attachment O). Pages 126 to 147 of Brief Attachment N describes "crystallographic and magnetic properties of perovskite and perovskite-related compounds", see title of Section 3 at page 126. Section 3.2.3.1 starting at page 192 of "Landholt-Börnstein" Vol. 4 (See Brief Attachment N) is entitled "Bismuth Compounds". Thus Bismuth perovskite-like compounds and how to make them were well known more than 16 years prior to Applicants' discovery. Thus the "Landholt Börnstein" book published in 1970, more than 16 years before Applicants' discovery, shows that the term "perovskite-like" or "perovskite related" is understood by persons of skill in the art prior to Applicants' priority date. Moreover, the "Landholt-Börnstein" book cites references for each compound listed. Thus a person of ordinary skill in the art of ceramic fabrication knows how to make each of these compounds. Pages 376-380 of Biref Attachment N has figures showing the crystal structure of compounds containing Bi and Pb.

33. Paragraph 33 of each DST AFFIDAVIT note that the standard reference "Landholt-Börnstein, Volume 3, Ferro- and Antiferroelectric Substances" (1969) provides at pages 571-584 an index to substances. (See Brief Attachment P). This list contains numerous Bi and Pb containing compounds. See, for example pages 578 and 582-584. Thus a person of ordinary skill in the art of ceramic fabrication would be motivated by Applicants' teaching to fabricate Bi and/or Pb containing compounds that come within the scope of the Applicants' claims.

34. Paragraph 34 of each DST AFFIDAVIT note that the standard reference "Landholt-Börnstein Volume 3 Ferro- and Antiferroelectric Substances" (1969) (See Brief Attachment P) at page 37, section 1 is entitled "Perovskite-type oxides." This standard reference was published more than 17 years before Applicants' discovery. The properties of perovskite-type oxides are listed from pages 37 to 88. Thus the term perovskite-type was well known and understood by persons of skill in the art of ceramic fabrication prior to Applicants' discovery and more than 17 years before Applicants' discovery persons of ordinary skill in the art knew how to make Bi, Pb and many other perovskite, perovskite-like, perovskite-related and perovskite-type compounds.

35. Paragraph 35 of each DST AFFIDAVIT note that at page 14, line 10-15 of the Bednorz-Mueller application, Applicants' state "samples in the Ba-La-Cu-O system, when subjected to x-ray analysis, revealed three individual crystallographic phases V.12. a first layer-type perovskite-like phase, related to the $K_2N_iF_4$ structure ..." Applicants' priority document EP0275343A1 filed July 27, 1988, is entitled "New Superconductive Compounds of the K_2NiF_4 Structural Type Having a High Transition Temperature, and Method for Fabricating Same." See (See Brief Attachment AE). The book "Structure and Properties of Inorganic Solids" by Francis S. Galasso, Pergamon Press (1969) at page 190 lists examples of Tallium (Tl) compounds in the K_2NiF_4 structure. (See Brief Attachment Q). Thus based on Applicants' teachings prior to Applicants' discovery, a person of ordinary skill in the art of ceramic fabrication would be motivated to fabricate Thallium based compounds to test for high Tc superconductivity in view of Applicants' teaching.

36. Paragraph 36 of each DST AFFIDAVIT note that the book "Crystal Structures" Volume 4, by Ralph W. G. Wyckoff, Interscience Publishers, 1960 states at page 96 "This structure, like these of $Bi_4Ti_2O_{12}$ (IX, F_{12}) and Ba Bi_4 Ti_4 O_4 (XI, 13) is built up of alternating Bi_2O_2 and perovskite-like layers." Thus layer

of perovskite-like Bismuth compounds was well known in the art in 1960 more than 26 years before Applicants' priority date. (See Brief Attachment R).

37. Paragraph 37 of each DST AFFIDAVIT note that the book "Modern Oxide Materials Preparation, Properties and Device Applications" edited by Cockayne and Jones, Academic Press (1972) states (See Brief Attachment S) at page 155 under the heading "Layer Structure Oxides and Complex Compounds":

> "A large number of layer structure compounds of general formula $(Bi_2O_2)^{2+}$ $(A_{x-1}B_xO_{3x+1})^{2-}$ have been reported (Smolenskii et al. 1961; Subbarao, 1962), where A = Ca, Sr, Ba, Pb, etc., B = Ti, Nb, Ta and x = 2, 3, 4, or 5. The structure had been previously investigated by Aurivillius (1949) who described them in terms of Alternate $(Bi_2O_2)^{2+}$ layers and perovskite layers of oxygen octahedra. Few have been found to be ferroelectric and include $SrBi_2Ta_2O_9$ (T_c = 583°K), $PbBi_2Ta_2O_9$ (T_c = 703°K), $BiBi_3Ti_2TiO_{12}$ or $Bi_4Ti_3O_{12}$ (T_c = 948°K), $Ba_2Bi_4Ti_5O_{18}$ (T_c = 598°K) and $Pb_2Bi_4Ti_5O_{18}$ (T_c = 583°K). Only bismuth titanate $Bi_4Ti_3O_{12}$ has been investigated in detail in the single crystal form and is finding applications in optical stores (Cummins, 1967) because of its unique ferroelectric-optical switching properties. The ceramics of other members have some interest because of their dielectric properties. More complex compounds and solid solutions are realizable in these layer structure oxides but none have significant practical application."

Thus the term layered oxides was well known and understood prior to Applicants' discovery. Moreover, layered Bi and Pb compounds were well known in 1972 more than 15 years before Applicants' discovery.

38. Paragraph 38 of each DST AFFIDAVIT note that the standard reference "Landholt-Börnstein, Volume 3, Ferro and Antiferroelectric Substances" (1969) at pages 107 to 114 (See Brief Attachment T) list "layer-structure oxides" and their properties. Thus the term "layered compounds" was well known in the art of ceramic fabrication in 1969 more than 16 years prior to Applicants' priority date and how to make layered compounds was well known prior to applicants priority date.

39. Paragraph 39 of each DST AFFIDAVIT note that layer perovskite type Bi and Pb compounds closely related to the Bi and Pb high T_c compounds in the composite table above in paragraph 18 have been known for some time. For example, the following is a list of four articles which were published about 35 years prior to Applicants' discovery:

(1) Attachment V - "Mixed bismuth oxides with layer lattices", B. Aurivillius, Arkiv Kemi 1, 463, (1950).

(2) Attachment W - "Mixed bismuth oxides with layered lattices ", B. Aurivillius, Arkiv Kemi 1, 499, (1950).

(3) Attachment X - "Mixed bismuth oxides with layered lattices ", B. Aurivillius, Arkiv Kemi 2, 519, (1951).

(4) Attachment Y - "The structure of Bi_2NbO_5F and isomorphous compounds", B. Aurivillius, Arkiv Kemi 5, 39, (1952).

These articles will be referred to as Aurivillius 1, 2, 3 and 4, respectively.

40. Paragraph 40 of each DST AFFIDAVIT notes that Brief Attachment V (Aurivillius 1), at page 463, the first page, has the subtitle "I. The structure type of $CaNb_2Bi_2O_9$. Attachment V states at page 463:

> X-ray analysis ... seemed to show that the structure was built up of $Bi_2O^2{}_2^+$ layers parallel to the basal plane and sheets of composition $Bi_2Ti_3O^2{}_{10}^-$. The atomic arrangement within the $Bi_2Ti_3O^2{}_{10}^-$ sheets seemed to be the same as in structure of the perovskite type and the structure could then be described as consisting of $Bi_2O^2{}_2^+$ layers between which double perovskite layers are inserted.

41. Paragraph 41 of each DST AFFIDAVIT note that Brief Attachment V (Aurivillius 1) at page 464 has a section entitled "$PbBi_2Nb_2O_9$ Phase". And at page 471 has a section entitled "Bi_3NbTiO_9". And at page 475 has a table of compounds having the "$CaBi_2Nb_2O_9$ structure" listing the following compounds Bi_3NbTiO_9, Bi_3TaTiO_9, $CaBi_2Nb_2O_9$, $SrBi_2Nb_2O_9$, $SrBi_2Ta_2O_9$, $BaBi_2Nb_2O_9$, $PbBi_2Nb_2O_9$, $NaBi_5Nb_4O_{18}$, $KBi_5Nb_4O_{18}$. Thus Bi and Pb layered perovskite compounds were well known in the art about 35 years prior to Applicants' discovery.

42. Paragraph 42 of each DST AFFIDAVIT note that Brief Attachment W (Aurivillius 2) at page 499, the first page, has the subtitle "II Structure of $Bi_4Ti_3O_{12}$". And at page 510, Fig. 4 shows a crystal structure in which "A denotes a perovskite layer $Bi_2Ti_3O^2{}_{10}^-$, C $Bi_2O^2{}_2^+$ layers and B unit cells of the hypothetical perovskite structure $BiTiO_3$."

43. Paragraph 43 of each DST AFFIDAVIT note that Brief Attachment X (Aurivillius 3) has at page 519, the first page, the subtitle "III Structure of $BaBi_4Ti_4O_{15}$". And in the first paragraph on page 519 states referring to the articles of Brief Attachments V (Aurivillius 1), and W (Aurivillius 2) "X ray studies on the compounds $CaBi_2Nb_2O_9$ [the article of Brief Attachment V] and $Bi_4Ti_3O_{12}$ [the article of Brief Attachment W] have shown that the comparatively complicated chemical formulae of these compounds can be explained by simple layer structures being built up from $Bi_2O^2{}_2^+$ layers and perovskite layers. The unit cells are pictured schematically in Figs. 1a and 1c." And Fig. 4 at page 526 shows "One half of a unit cell of $BaBi_4Ti_4O_{15}$. A denotes the perovskite region and B the Me_2O_4 layer" where Me represents a metal atom.

44. Paragraph 44 of each DST AFFIDAVIT note that Brief Attachment Y (Aurivillius 4) is direct to structures having the $Bi_3N_{10}O_3F$ structure.

45. Paragraph 45 of each DST AFFIDAVIT note that Brief Attachment AA is a list of Hg containing solid state compounds from the 1989 Powder Diffraction File Index. Applicants do not have available to them an index from prior to Applicants' priority date. The Powder Diffraction File list is a compilation of all known solid state compounds with reference to articles directed to the properties of these compositions and the methods of fabrication. From Brief Attachment AA it can be seen, for example, that there are numerous examples of Hg based compounds. Similarly, there are examples of other compounds in the Powder Diffraction File. A person of ordinary skill in the art is aware of the Powder Diffraction File and can from this file find a reference providing details on how to fabricate these compounds. Thus persons of ordinary skill in the art would be motivated by Applicants' teaching to look to the Powder Diffraction File for examples of previously fabricated composition expected to have properties similar to those described in Applicants' teaching.

46. Paragraph 46 of each DST AFFIDAVIT note that it is generally recognized that it is not difficult to fabricate transition metal oxides and in particular copper metal oxides that are superconductive after the discovery by Applicants of composition, such as transition metal oxides, that are high T_c superconductors. This is noted in the book "Copper Oxide Superconductors" by Charles P. Poole, Jr., Timir Datta and Horacio A. Farach, John Wiley & Sons (1998), referred to herein as Poole 1988: Chapter 5 of Poole 1988 (See Brief Attachment AF and AW) in the book entitled "Preparation and Characterization of Samples" states at page 59 "[c]opper oxide superconductors with a purity sufficient to exhibit zero resistivity or to demonstrate levitation (Early) are not difficult to synthesize. We believe that this is at least partially responsible for the explosive worldwide growth in these materials". Poole 1988 further states at page 61 "[i]n this section three methods of preparation will be described, namely, the solid state, the coprecipitation, and the sol-gel techniques (Hatfi). The widely used solid-state technique permits off-the-shelf chemicals to be directly calcined into superconductors, and it requires little familiarity with the subtle physicochemical

process involved in the transformation of a mixture of compounds into a superconductor." Poole 1988 further states at pages 61-62 "[i]n the solid state reaction technique one starts with oxygen-rich compounds of the desired components such as oxides, nitrates or carbonates of Ba, Bi, La, Sr, Ti, Y or other elements. ... These compounds are mixed in the desired atomic ratios and ground to a fine powder to facilitate the calcination process. Then these room-temperature-stabile salts are reacted by calcination for an extended period (~20hr) at elevated temperatures (~900°C). This process may be repeated several times, with pulverizing and mixing of the partially calcined material at each step." This is generally the same as the specific examples provided by Applicants and as generally described at pages 8, line 19, to page 9, line 5, of the Bednorz-Mueller application which states "[t]he methods by which these superconductive compositions can be made can use known principals of ceramic fabrication, including the mixing of powders containing the rare earth or rare earth-like, alkaline earth, and transition metal elements, coprecipitation of these materials, and heating steps in oxygen or air. A particularly suitable superconducting material in accordance with this invention is one containing copper as the transition metal. "Each DST AFFIDAVIT states in paragraph 46 "Consequently, it is my opinion that Applicants have fully enabled high T_c materials oxides and their claims."

47. Paragraph 47 of each DST AFFIDAVIT note that Charles Poole et al. published another book in 1995 entitled "Superconductivity" Academic Press which has a Chapter 7 on "Perovskite and Cuprate Crystallographic Structures". (See Brief Attachment Z). This book will be referred to as Poole 1995.

At page 179 of Poole 1995 states:

V. PEROVSKITE-TYPE SUPERCONDUCTING STRUCTURES
In their first report on high-temperature superconductors Bednorz and Müeller (1986) referred to their samples as "metallic, oxygen-

deficient ... perovskite-like mixed-valence copper compounds." Subsequent work has confirmed that the new superconductors do indeed possess these characteristics.

Paragraph 47 of each DST AFFIDAVIT states "I agree with this statement."

48. Paragraph 48 of each DST AFFIDAVIT note that the book "The New Superconductors", by Frank J. Owens and Charles P. Poole, Plenum Press, 1996, referred to herein as Poole 1996 in Chapter 8 entitled "New High Temperature Superconductors" starting a page 97 (See Brief Attachment AG) shows in Section 8.3 starting at page 98 entitled "Layered Structure of the Cuprates" schematic diagrams of the layered structure of the cuprate superconductors. Poole 1996 states in the first sentence of Section 8.3 at page 98 "All cuprate superconductors have the layered structure shown in Fig. 8.1." This is consistent with the teaching of Bednorz and Mueller that "These compositions have a layer-type Crystalline Structure often Perovskite-like" as noted in paragraph 14 of each of the DST AFFIDAVITS (above). Poole 1996 further states in the first sentence of Section 8.3 at page 98 "The flow of supercurrent takes place in conduction layers and bonding layers support and hold together the conduction layers". The caption of Fig. 8.1 states "Layering scheme of the cuprate superconductors". Fig. 8.3 shows details of the conduction layers for difference sequence of copper oxide planes and Fig. 8.4 presents details of the bonding layers for several of the cuprates which include binding layers for lanthanum superconductor La_2CuO_4, neodymium superconductor Nd_2CuO_4, yttrium superconductor $YBa_2Cu_3O_{2n+4}$, bismuth superconductor $Bi_2Sr_2Ca_{n-1}Cu_nO_{2n+4}$, thallium superconductor $Tl_2Ba_2Ca_{n-1}Cu_nO_{2n+4}$, and mercury superconductor $HgBa_2Ca_{n-1}Cu_nO_{2n+2}$. Fig. 8.5 at pages 102 and 103 show a schematic atomic structure showing the layering scheme for thallium superconductors. Fig. 8.10 at page 109 shows a schematic crystal structure showing the layering scheme for La_2CuO_4. Fig. 8.11 at page 110

shows a schematic crystal structure showing the layering scheme for $HgBa_2Ca_2Cu_3O_{8+x}$. Paragraph 48 of each DST AFFIDAVIT states that "[t]he layering shown in Poole 1996 for high T_c superconductors is consistent with the layering as taught by Bednorz and Mueller in their patent application."

49. Paragraph 49 of each DST AFFIDAVIT note that thus Poole 1988 states that the high T_c superconducting materials "are not difficult to synthesize" and Poole 1995 states that "the new superconductors do indeed possess [the] characteristics" that Applicants' specification describes these new superconductors to have. Poole 1996 provide details showing that high T_c superconductors are layered or layer-like as taught by Bednorz and Mueller. Therefore, as of Applicants' discovery persons of ordinary skill in the art of ceramic fabrication were enabled to practice Applicants' invention to the full scope that it is presently claimed, including in the claims that are not allowed from the teaching in the Bednorz-Mueller application without undue experimentation that is by following the teaching of Bednorz and Mueller in combination with what was known to persons of ordinary skill in the art of ceramic fabrication. In paragraph 49 east DST AFFIDAVIT states "The experiments to make high T_c superconductors not specifically identified in the Bednorz-Mueller application were made by principles of ceramic fabrication prior to the date of their first publication. It is within the skill of a person of ordinary skill in the art of ceramic fabrication to make compositions according to the teaching of the Bednorz-Mueller application to determine whether or not they are high T_c superconductors without undue experimentation."

50. Paragraph 50 of each of the DST AFFIDAVITS states:

> I have personally made many samples of high Tc superconductors following the teaching of Bednorz and Mueller as found in their patent applications. In making these materials it was not necessary to use starting materials in stoichiometric proportions to produce a high T_c superconductor with insignificant secondary phases or multi-phase compositions, having a superconducting portion and a

> non-superconducting portion, where the composite was a high Tc superconductor. Consequently, following the teaching of Bednorz and Mueller and principles of ceramic science known prior to their discovery, I made, and persons of skill in the ceramic arts were able to make, high T_c superconductors without exerting extreme care in preparing the composition. Thus I made and persons of skill in the ceramic arts were able to make high T_c superconductors following the teaching of Bednorz and Mueller, without experimentation beyond what was well known to a person of ordinary skill in the ceramic arts prior to the discovery by Bednorz and Mueller.

In the Final Action the Examiner has not specifically commented on the arguments of the DST AFFIDAVITS, therefore it's Applicants' understanding that the Examiner agrees with the DST AFFIDAVITS. Since the Examiner has not rebutted the DST AFFIDAVITS affiants qualifications, it is Applicants' understanding that the Examiner accepts the DST AFFIDAVITS (and the affiants of the affidavits of Brief Attachments AH to AL) as reliable experts in the ceramic arts, in particular the superconductive ceramic arts.

EXAMINER'S ARGUMENTS IN THE FINAL REJECTION

In the Final Office Action at page 4 the Examiner states:

> Applicant remarks regarding these rejections have been fully considered. A rebuttal follows below. In arguing the instant enablement rejection, applicant contends that the Examiner has not provided any factual evidence that the art of high temperature superconductivity is an extremely unpredictable one.

As shown above the patent legal term "predictable art" or "unpredictable art" is not synonymous with "theoretical predictability," but means "how to make and use" predictability which is the standard of 35 USC 112, first paragraph. The evidence submitted by Applicants clearly shows that persons of skill in the art know how "to make and use" species that come within the scope of Applicants' claims and thus the art of the high T_c superconductors is a "predictable art" within the meaning of that term in the patent law. A predictable art is one in which species within the scope of the claim can be determined without undue experimentation or testing (See Ex parte Jackson Supra)

At page 4 to 5 of the Final Action the Examiner states:

> Applicant's statements include:
>
> Applicants request that the Examiner provide an Examiner's affidavit showing that the Examiner has expertise to make such a statement not supported by documented factual evidence (Response filed 1/31/05, page 119).:
> The Examiner should withdraw the rejection, provide factual evidence to support the opinion or submit an Examiner's affidavit under MPEP 706.02(a) qualifying himself as an expert in the art of high Tc. superconductivity to offer such a conclusory opinion (Response filed 1/31/05, page 121).

The Examiner has not provided the requested Examiner's affidavit.

The Examiner further quotes Applicants:

> The Examiner has provided no evidence to support the statement 'that at the time the invention was made, the theoretical mechanism of superconductivity in these materials was not well understood. This mechanism is still not understood'. Applicant's request the Examiner to introduce evidence to support this statement or to place an Examiner's affidavit under MPEP 706.02(a) qualifying himself as an expert to make this statement (Response filed 1/31/05, page 136) .

The Examiner did not provide the requested Examiner's affidavit, but the Examiner states:

> Enclosed are articles relating to experimental and theoretical work on superconductivity.
>
> Schuller et al "A Snapshot View of High Temperature Superconductivity 2002" (report from workshop on High Temperature Superconductivity held April 5-8, 2002 in San Diego) discusses both the practical applications and theoretical mechanisms relating to superconductivity.

At page 4, the Schuller reference states:

> Basic research in high temperature superconductivity, because the complexity of the materials, brings together expertise from materials scientists, physicists and chemists, experimentalists and theorists... It is important to realize that this field is based on complex materials and because of this materials science issues are crucial. Microstructures, crystallinity, phase variations, nonequilibrium phases, and overall structural issues playa crucial role and can strongly affect the physical properties of the materials. Moreover, it seems that to date there are no clear-cut directions for searches for new superconducting phases, as shown by the serendipitous discovery of superconductivity in M_gB_2. Thus studies in which the nature of chemical bonding and how this arises in existing superconductors may prove to be fruitful. Of course, "enlightened" empirical searches either guided by chemical and materials intuition or systematic searches using well-defined strategies may prove to be fruitful. It is interesting to note that while empirical searches in the oxides gave rise to many superconducting systems, similar (probable?) searches after the discovery of superconductivity in

M_gB_2 have not uncovered any new superconductors (Referred to herein as Schuller Paragraph 1).

At pages 5-6, the Schuller reference states:

> The theory of high temperature superconductivity has proven to be elusive to date. This is probably as much caused by the fact that in these complex materials it is very hard to establish uniquely even the experimental phenomenology, as well as by the evolution of many competing models, which seem to address only particular aspects of the problem. The Indian story of the blind men trying to characterize the main properties of an elephant by touching various parts of its body seems to be particularly relevant. It is not even clear whether there is a single theory of superconductivity or whether various mechanisms are possible. Thus it is impossible to summarize, or even give a complete general overview of all theories of superconductivity and because of this, this report will be very limited in its theoretical scope.
> (Referred to herein as Schuller Paragraph 2)

At page 7, the Schuller reference states:

> Thus far " the existence of ,a totally new superconductor has proven impossible to predict from first principles. Therefore their discovery has been based largely on empirical approaches, intuition, and. even serendipity. This unpredictability is at the root of the excitement that the condensed matter community displays at the discovery of a new material that is superconducting at high temperature.
> (Referred to herein as Schuller Paragraph 3)

In response to the Schuller article Applicants submitted the Affidavit of Newns (Brief Attachment AP). The Affidavit of Newns describes in detail what a theory is in solid state science and comments on the three paragraphs from Schuller that the Examiner relies on. Dr. Newns has qualified himself as an expert in theoretical solid state science. The Examiner has not commented on nor rebutted Dr. Newns' affidavit (Brief Attachment AP.)

Dr. Newns Affidavit

1. Paragraph 4 of the Newns Affidavit lists Dr. Newns educational history to qualify him as an expert in the field of theoretical solid state science.
2. Paragraph 2 of the Newns Affidavit refers to Dr. Newns stating that his resume and curriculum vitale are attached to the affidavit to qualify Dr. Newns as an expert in the theoretical solid state science.
3. Paragraph 3 of the Newns Affidavit refers to page 4 of the Final Rejection which cites Schuller et al "A Snapshot View of High Temperature Superconductivity 2002" (report from workshop on High Temperature Superconductivity held April 5-8, 2002 in San Diego) which the Examiner states "discusses both the practical applications and theoretical mechanisms relating to superconductivity."
4. Paragraph 4 of the Newns Affidavit quotes the passage that the Examiner at page 4 of the Final Action cites from page 4 of Schuller et al. (Schuller Paragraph 1)
5. Paragraph 5 of the Newns Affidavit quotes the passage that the Examiner at pages 4 -5 of the Final Action cites from pages 5- 6 of Schuller et al. (Schuller Paragraph 2)
6. Paragraph 5 of the Newns Affidavit quotes the passage that the Examiner at page 5 of the Final Action cites page 7 of Schuller et al. (Schuller Paragraph 3)
7. In Paragraph 7 of the Newns Affidavit Dr. Newns states that he is submitting his declaration to clarify what is meant by predictability in theoretical solid state science. Dr. Newns notes that all solid state materials, even elemental solids, present theoretical problems. That difficulty begins with the basic mathematical formulation of quantum mechanics and how to take into account all interactions that are involved in atoms having more than one electron and where the interactions between the atoms may be covalent, ionic or Van der Waals interactions. A theory of a solid is based on approximate mathematical formalisms to represent these interactions. A theoretical solid

state scientist makes an assessment using physical intuition, mathematical estimation and experimental results as a guide to focus on features of the complex set of interactions that this assessment suggests are dominant in their effect on the physical phenomena for which the theorist is attempting to develop a theory. This process results in what is often referred to as mathematical formalism. This formalism is then applied to specific examples to determine whether the formalism produces computed results that agree with measured experimental results. This process can be considered a "theoretical experiment." For example, applying the theoretical formalism to a particular crystal structure comprised of a particular set of atoms to compute a value of a desired property is in this context a "theoretical experiment."

8. Paragraph 8 of the Newns Affidavit notes that even when a successful theoretical formalism is developed, that formalism does not produce a list of materials that have a particular property that is desired. Rather for each material of interest the same "theoretical experiment" must be conducted. Moreover, even if such a "theoretical experiment" indicates that the particular material investigated has the property, there is no assurance that it does without experimentally fabricating the material and experimentally testing whether it has that property.
9. In paragraph 8 of the Newns Affidavit Dr. Newns notes for example, semiconductors have been studied both experimentally and theoretically for more than 50 years. The theory of semiconductors is well understood. A material is a semiconductor when there is a filled valence band that is separated from the next empty or almost empty valence band by an energy that is of the order of the thermal energy of an electron at ambient temperature. The electrical conductivity of the semiconductor is controlled by adding dopants to the semiconductor crystal that either add electrons to the empty valence band or remove electrons from the filled valence band. Notwithstanding this theoretical understanding of the physical phenomena of semiconductivity, that understanding does not permit either a theoretical or experimental solid state scientist to know a *priori* what materials will in fact be

a semiconductor. Even with the well developed semiconductor theoretical formalisms, that theory cannot be asked the question "can you list for me all materials that will be a semiconductor?" Just as an experimentalist must do, the theoretical scientist must select a particular material for examination. If the particular material already exists, an experimentalist can test that material for the semiconducting property. If the particular material does not exist, the theoretical solid state scientist must first determine what the crystal structure will be of that material. This in of itself may be a formidable theoretical problem to determine accurately. Once a crystal structure is decided on, the theoretical formalism is applied in a "theoretical experiment" to determine if the material has the arraignment of a fully filled valence and an empty valence band with the correct energy spacing. Such a theoretical experiment generally requires the use of a computer to compute the energy band structure to determine if for the selected composition the correct band configuration is present for the material to be a semiconductor. This must be verified by experiment. Even with the extensive knowledge of semiconducting properties such computations are not 100% accurate and thus theory cannot predict with 100% accuracy what material will be a semiconductor. Experimental confirmation is needed. Moreover, that a theoretical computation is a "theoretical experiment" is in the conceptual sense not different than a physical experiment. The theorist starting out on a computation, just as an experimentalist staring out on an experiment, has an intuitive feeling that, but does not know whether, the material studied will in fact be a semiconductor. As stated above solid state scientists, both theoretical and experimental, are initially guided by physical intuition based on prior experimental and theoretical work. Experiment and theory complement each other, at times one is ahead of the other in an understanding of a problem, but which one is ahead changes over time as an understanding of the physical phenomena develops.

10. Paragraph 10 of the Newns Affidavit notes that the description of the semiconductor situation is for illustration of the capability of theory in solid

state science where there is a long history of both experimental and theoretical developments.

11. Paragraph 11 of the Newns Affidavit notes that superconductivity was first discovered by H. Kammerlingh Onnes in 1911 and the basic theory of superconductivity has been known many years before Applicants' discovery. For example, see the book "Theory of Superconductivity", M. von Laue, Academic Press, Inc., 1952 (See Brief Attachment AD). Prior to Applicants' discovery superconductors were grouped into two types: Type I and Type II.

12. Paragraph 12 of the Newns Affidavit notes that the properties of Type I superconductors were modeled successfully by the efforts of John Bardeen, Leon Cooper, and Robert Schrieffer in what is commonly called the BCS theory. A key conceptual element in this theory is the pairing of electrons close to the Fermi level into Cooper pairs through interaction with the crystal lattice. This pairing results from a slight attraction between the electrons related to lattice vibrations; the coupling to the lattice is called a phonon interaction. Pairs of electrons can behave very differently from single electrons which are fermions and must obey the Pauli exclusion principle. The pairs of electrons act more like bosons which can condense into the same energy level. The electron pairs have a slightly lower energy and leave an energy gap above them on the order of .001 eV which inhibits the kind of collision interactions which lead to ordinary resistivity. For temperatures such that the thermal energy is less than the band gap, the material exhibits zero resistivity. (Applicants; claim 31 explicitly recites "said composition has crystalline structure which enhances electron-phonon interactives to produce superconductivity at a temperature greater than or equal 26K."

13. Paragraph 13 of the Newns Affidavit notes that there are about thirty pure metals which exhibit zero resistivity at low temperatures and have the property of excluding magnetic fields from the interior of the superconductor (Meissner effect). They are called Type I superconductors. The superconductivity exists only below their critical temperatures and below a

critical magnetic field strength. Type I and Type II superconductors (defined below) are well described by the BCS theory.

14. Paragraph 14 of the Newns Affidavit notes that starting in 1930 with lead-bismuth alloys, a number of alloys were found which exhibited superconductivity; they are called Type II_superconductors. They were found to have much higher critical fields and therefore could carry much higher current densities while remaining in the superconducting state.

15. Paragraph 15 of the Newns Affidavit notes that ceramic materials are expected to be insulators -- certainly not superconductors, but that is just what Georg Bednorz and Alex Muller, the inventors of the present patent application under examination, found when they studied the conductivity of a lanthanum-barium-copper oxide ceramic in 1986. Its critical temperature of 30 K was the highest which had been measured to date, but their discovery started a surge of activity which discovered materials exhibiting superconducting behavior in excess of 125 K. The variations on the ceramic materials first reported by Bednorz and Muller which have achieved the superconducting state at much higher temperatures are often just referred to as high temperature superconductors and form a class of their own.

16. Paragraph 16 of the Newns Affidavit notes that it is generally believed by theorists that Cooper pairs result in High Tc superconductivity. What is not understood is why the Cooper pairs remain together at the higher temperatures. A phonon is a vibration of the atoms about their equilibrium positions in a crystal. As temperature increases these vibrations are more complex and the amplitude of these vibrations is larger. How the Cooper pairs interact with the phonons at the lower temperature, when these oscillations are less complex and of lower amplitude, is understood, this is the BCS theory. Present theory is not able to take into account the more complex and larger amplitude vibrations that occur at the higher temperatures.

17. Paragraph 17 of the Newns Affidavit notes that in the article of Schuller referred to by the Examiner paragraphs 4, 5 and 6 present essentially the same picture.

18. Paragraph 18 of the Newns Affidavit notes that in Schuller paragraph 4 of the Schuller Affidavit (from pages 4 to 5 of The Final Action Schuller paragraphs 1, 2 and 3) above Schuller states "Of course, 'enlightened' empirical searches either guided by chemical and materials intuition or systematic searches using well-defined strategies may prove to be fruitful. It is interesting to note that while empirical searches in the oxides gave rise to many superconducting systems, similar (probable?) searches after the discovery of superconductivity in MgB_2 have not uncovered any new superconductors." Schuller is acknowledging that experimental researchers using intuition and systematic searches found the other known high Tc superconductors. Systematic searching is applying what is known to the experimental solid state scientist, that is, knowledge of how to fabricate compounds of the same class as the compounds in which Bednorz and Muller first discovered High Tc superconductivity. That a similar use of intuition and systematic searching "after the discovery of superconductivity in MgB_2 have not uncovered any new superconductors" is similar to a "theoretical experiment" that after the computation is done does not show that the material studied has the property being investigated, such as semiconductivity. The Schuller article was published in April 2002 approximately one year after the experimental discovery of superconductivity in MgB_2 was reported on in March 2001 (Reference 8 of the Schuller article. See paragraph 19 of the Newns Affidavit.) This limited time of only one year is not sufficient to conclude that systematic searching "after the discovery of superconductivity in MgB_2 " cannot uncover any new superconductors. Experimental investigations of this type are not more unpredictable than theoretical investigations since the experimental investigation has a known blue print or course of actions, just as does a "theoretical experiment." Just as a physical experimental investigation may lead to a null result, a "theoretical experiment" may lead to a null result. In the field of High Tc superconductivity physical experiment is as predictable as a well developed theory since the experimental procedures are well known even though very complex.

Experimental complexity does not mean the field of High Tc superconductivity is unpredictable since the methods of making these material are so well known.

19. Paragraph 19 of the Newns Affidavit notes that in Schuller paragraph 1 in paragraph 4 of the Newns Affidavit above Schuller refers to the discovery of MgB_2 citing the paper of Nagamatsu et al. Nature Vol. 410, March 2001 in which the MgB_2 is reported to have a Tc of 39 K, to have a layered graphite crystal structure and to be made from powders using know ceramic processing methods. MgB_2 has a substantially simpler structure than the first samples reported on by Bednorz and Muller and therefore, can be more readily investigated theoretically. There have been recent reports by Warren Pickett of the University of California at Davis and by Marvin L. Cohen and Steven Louie at the University of California at Berkeley describing progress in a theoretical understanding of the Tc of M_gB_2. It is not surprising that progress in the theory of superconductivity at 39 K has been made based on this relatively simple material. In fact a few months after the Schuller article was published in April 2002 Marvin .L Cohen and Steven Louie were authors on an article Choi, HJ; Roundy, D; Sun, H; Cohen, ML; Louie, SG "First-principles calculation of the superconducting transition in MgB_2 within the anisotropic Eliashberg formalism " PHYSICAL REVIEW B; JUL 1, 2002; Vol. 66; p 20513. The following is from the Abstract of this article:

> "We present a study of the superconducting transition in MgB_2 using the ab initio pseudopotential density-functional method, a fully anisotropic Eliashberg equation, and a conventional estimate for//*. Our study shows that the anisotropic Eliashberg equation, constructed with ab initio calculated momentum-dependent electron-phonon interaction and anharmonic phonon frequencies, yields an average electron-phonon coupling constant A=0.61, a transition temperature Tc=39 K, and a boron isotope-effect exponent a(B)=0.32. <u>The calculated values for Tc. *X*, and g(B) are in excellent agreement with transport, specific-heat, and isotope-effect measurements, respectively</u>. The individual values of the electron-phonon coupling 2(k,k(')) on the various pieces of the Fermi surface, however, vary from 0.1 to 2.5. The observed Tc is a result of both the raising effect of anisotropy in the electron-phonon couplings and the

lowering effect of anharmonicity in the relevant phonon modes." (Emphasis added)

Thus the statement of the Schuller article in Schuller paragraph 2 (quoted in paragraph 5 of the Newns Affidavit) above "The theory of high temperature superconductivity has proven to be elusive to date" is not totally accurate since shortly after the publication of the Schuller article a theory of the Tc of MgB_2 was published by Marvin L. Cohen and Steven Louie.

A month later they expanded on this in the article Choi, HJ; Roundy, D; Sun, H; Cohen, ML; Louie, SG "The origin of the anomalous superconducting properties of MgB2" NATURE, AUG 15, 2002;Vol 418; pp 758-760. The following is from the Abstract of this article:

> " Magnesium diboride ... differs from ordinary metallic superconductors in several important ways, including the failure of conventional models ... to predict accurately its unusually high transition temperature, the effects of isotope substitution on the critical transition temperature, and its anomalous specific heat... A detailed examination of the energy associated with the formation of charge-carrying pairs, referred to as the 'superconducting energy gap', should clarify why MgB_2 is different. Some early experimental studies have indicated that MgB_2 has multiple gaps... Here we report an ab initio calculation of the superconducting gaps in MgB_2 and their effects on measurable quantities. An important feature is that the electronic states dominated by orbitals in the boron plane couple strongly to specific phonon modes, making pair formation favourable. This explains the high transition temperature, the anomalous structure in the specific heat, and the existence of multiple gaps in this material. <u>Our analysis suggests comparable or higher transition temperatures may result in layered materials based on B. C and N with partially filled planar orbitals.</u> (Emphasis added)

Thus the statement in the Schuller article in paragraph 5 of the Newns Affidavit (Schuller Paragraph 2 above) "Thus far, the existence of, a totally new superconductor has proven impossible to predict from first principles" was shown by the work of Marvin .L. Cohen and Steven Louie published shortly after the article of Schuller also to be not totally accurate. Moreover, the highlighted

section of the abstract refers to layered as a property of the materials just as Applicants' specification has identified as a property of high Tc superconductors. See Applicants' original claim 9.

20. Paragraph 20 of the Newns Affidavit notes that in paragraph 5 of the Newns Affidavit above (Schuller Paragraph 2) Schuller states "The theory of high temperature superconductivity has proven to be elusive to date." As stated above although solid state theorist believe that Cooper Pairs are the mechanism of the High Tc superconductors, we do not as of yet completely understand how to create a mathematical formalism that takes into account the atomic vibrations at these higher temperatures to theoretically permit that electrons to remain paired.

21. Paragraph 21 of the Newns Affidavit notes that in paragraph 5 of the Newns Affidavit above (Schuller Paragraph 2) Schuller further states "This is probably as much caused by the fact that in these complex materials it is very hard to establish uniquely even the experimental phenomenology." Even though these materials are complex that complexity does not have to be understood to make these material since experimental solid state scientists well understand the method of making these materials. The book "Copper Oxide Superconductors" by Charles P. Poole, Jr., Timir Datta and Horacio A. Farach, John Wiley & Sons (1998), (See Brief Attachment AF and AW) referred to herein as Poole 1988 states in Chapter 5 entitled "Preparation and Characterization of Samples" states at page 59:

> "Copper oxide superconductors with a purity sufficient to exhibit zero resistivity or to demonstrate levitation (Early) are not difficult to synthesize. We believe that this is at least partially responsible for the explosive worldwide growth in these materials".

Poole et al. further states at page 61:

> "In this section three methods of preparation will be described, namely, the solid state, the coprecipitation, and the sol-gel techniques (Hatfi). The

widely used solid-state technique permits off-the-shelf chemicals to be directly calcined into superconductors, and it requires little familiarity with the subtle physicochemical process involved in the transformation of a mixture of compounds into a superconductor."

22. Paragraph 22 of the Newns Affidavit states "It is thus clear that experimentalists knew, at the time of Benorz and Muller's discovery, how to make the High Tc class of material and that to do so it was not necessary to precisely understand the experimental phenomenology."

23. Paragraph 23 of the Newns Affidavit notes that Charles Poole et al. published another book in 1995 entitled "Superconductivity" Academic Press which has a Chapter 7 on "Perovskite and Cuprate Crystallographic Structures". (See Brief Attachment Z). This book will be referred to as Poole 1995. At page 179 of Poole 1995 states: "V. PEROVSKITE-TYPE SUPERCONDUCTING STRUCTURES In their first report on high-temperature superconductors Bednorz and Miiller (1986) referred to their samples as "metallic, oxygen-deficient... perovskite-like mixed-valence copper compounds." Subsequent work has confirmed that the new superconductors do indeed possess these characteristics."

24. Paragraph 24 of the Newns Affidavit states "thus Poole 1988 states that the high T_c superconducting materials are not difficult to synthesize and Poole 1995 states that the new superconductors do indeed possess [the] characteristics that Applicants' specification (the patent application currently under examination) describes these new superconductors to have."

25. Paragraph 25 of the Newns Affidavit quotes from Schuller Paragraph 2 in (paragraph 5 of the Newns Affidavit above) Schuller states:

> "The theory of high temperature superconductivity has proven to be elusive to date. This is ....caused by the fact ... the evolution of many competing models, which seem to address only particular aspects of the problem. The Indian story of the blind men trying to characterize the main properties of an elephant by touching various parts of its body seems to be particularly relevant. It is not even clear whether there is a single theory of

> superconductivity or whether various mechanisms are possible. Thus it is impossible to summarize, or even give a complete general overview of all theories of superconductivity and because of this, this report will be very limited in its theoretical scope."

Paragraph 25 of the Newns Affidavit notes that the initial development of a theory always considers the problem from many different aspects until the best and most fruitful approach is realized. That at this time "It is not even clear whether there is a single theory of superconductivity or whether various mechanisms are possible" does not mean that experimental solid state scientists do not know how make this class of High Tc materials. As stated by Poole 1988 and Poole 1995 the experimental solid state scientist does know how to make this class of High Tc materials.

26. Paragraph 26 of the Newns Affidavit notes that the Examiner at page 5 of the Final Action cites page 7 of Schuller et al (Schuller Paragraph 3) which states:

> "Thus far, the existence of, a totally new superconductor has proven impossible to predict from first principles. Therefore their discovery has been based largely on empirical approaches, intuition, and. even serendipity. This unpredictability is at the root of the excitement that the condensed matter community displays at the discovery of a new material that is superconducting at high temperature."

A first principles theory that accurately predicts all physical properties of a material does not exist for as simple a material as water in its solid form as ice which may very well be the most extensively studied solid material. Most theories of solid state materials have phenomenological components that are approximations based on empirical evidence. As stated above solid state theoretical scientists have not as of yet formulated a theoretical formalism that accounts for electrons remaining paired as Cooper pairs at higher temperatures. But this does not prevent experimental scientists from fabricating materials that have structurally similar properties to the materials first discovered by Bednorz and Muller. This is particularly true since the basic theory of superconductivity was also well known at the time of their

discovery and the methods of making these materials was well known at the time of their discovery. It was not necessary at the time of their discovery to have the specific theoretical mechanism worked out in detail in order to make samples to test for High Tc superconductivity. Even Schuller acknowledges "empirical searches in the oxides gave rise to many superconducting systems."

COMMENTS ON THE SCHULLER ARTICLE

Schuller Paragraph 1 as noted above and as discussed in the Newns Affidavit (Brief Attachment AP) states:

> Moreover, it seems that to date there are no clear-cut directions for searches for new superconducting phases, as shown by the serendipitous discovery of superconductivity in MgB_2. Thus studies in which the nature of chemical bonding and how this arises in existing superconductors may prove to be fruitful. Of course, "enlightened" empirical searches either guided by chemical and materials intuition or systematic searches using well-defined strategies may prove to be fruitful. It is interesting to note that while empirical searches in the oxides gave rise to many superconducting systems, similar (probable?) searches after the discovery of superconductivity in MgB_2 have not uncovered any new superconductors

And Schuller Paragraph 3 as noted above and as discussed in the Newns Affidavit (Brief Attachment AP) states:

> Thus far " the existence of ,a totally new superconductor has proven impossible to predict from first principles. Therefore their discovery has been based largely on empirical approaches, intuition, and. even serendipity. This unpredictability is at the root of the excitement that the condensed matter community displays at the discovery of a new material that is superconducting at high temperature.

Schuller clearly acknowledges that enlightened empirical searches guided by chemical and materials intuition or systematic searches using well-defined strategies gave rise to many superconducting systems in the oxides. As stated above once Applicants revealed their discovery this is what persons of ordinary skill in the art did to determine other species within the scope of Applicants' claims. This is clear acknowledgement that no undue experimentation was involved in this determination. Schuller paragraph 2 also states "similar (probable?) searches after the discovery of superconductivity in MgB_2 have not uncovered any new superconductors." This is clear acknowledgement that after the discovery of MgB_2, which is a layered material made by ceramic processing,

other species have been made by systematic studies guided by the same intuition, that is enabled, and tested and found not to be high Tc superconductors. That these materials were made and tested means that they were enabled. That they were tested and found not to be high Tc superconductors does not mean that they are not enabled. Schuller paragraph 1 refers to "the serendipitous discovery of superconductivity in MgB_2" and Schuller paragraph 3 refers to "Therefore their discovery has been based largely on empirical approaches, intuition, and. even serendipity." A serendipitous discovery is an unexpected result, which does not establish lack of enablement, but that discovery of such species may entitle the discoverer to a patent on that specie due to unexpected results as contemplated by In re Fisher Supra. Thus the Schuller article corroborates Applicants' position that their application enables the rejected claims. There is nothing in the Schuller article that states directly or implies that anything other than Applicants discovery and what was known prior to Applicants' discovery was used to make oxide or non-oxide species that were and were not high Tc superconductors. As noted above Applicants are not required to satisfy the enablement requirement to foresee all species that come within the scope of their claims when the can be determined with out undue experimentation and testing. When the USPTO allows a later claim to a species because of unexpected results, that does not render an earlier allowed genus claim to that species not enabled and invalid. Thus serendipity does not result in lack of enablement. This is consistent with In re Hogan Supra an In re Wright Supra which stat that information developed after the filing date of the genus cannot be used to enablement or lack of enablement.

In the Final Action at page 7 the Examiner states:

In a published article entitled "Exploring Superconductivity" published at

(http: //www.nobelchannel.com/learningstudio/ introduction), states:

> It is worth noting that there is no accepted theory to explain the high-temperature behavior of this type of compound. The BCS theory, which has proven to be a useful tool in understanding lower-temperature materials, does not adequately explain how the Cooper pairs in the new compounds hold together at such high temperatures. When Bednorz was asked how high-temperature superconductivity works, he replied, "If I could tell you, many of the theorists working on the problem would be very surprised."

Submitted with Applicants' Second Amendment After Final Rejection dated April 12, 2006 is a declaration under 37 CFR 1.132 (Brief Attachment AQ) of co-inventor Georg Bednorz explaining the meaning of the statement attributed to him "If I could tell you, many of the theorists working on the problem would be very surprised" in response to a question from the interviewer about the mechanism of High Tc superconductivity. Co-inventor Georg Bednorz states:

> I am an experimental scientist and in the field of solid state science, because of the complexities of theory and experiment, workers in the field are either experimentalist or theorist and typically not both. In this field, including the field of high Tc superconductivity, theory utilizes complex mathematical procedures about which theorist are expert. Thus theorist working in the field would have been surprised if, I , as an experimentalist, had been the sole person in the field to gain sufficient overview and experimental and theoretical insight, to propose a final theory of high temperature superconductivity at this early stage of research.

In the Final Action at page 7 the Examiner states:

> It is clear from these articles, published well after the filing date of the instant application, that the art is still considered complex and unpredictable, and that no single theory for the mechanism responsible for superconductivity has been generally accepted.

For the reasons given above Applicants respectfully disagree that the "art is ...unpredictable" within the meaning of the US patent law as described in detail

above. Applicants agree that the art is complex. As the Shaw Affidavit of 2005, the Tsuei Affidavit of 2005 and the Dinger Affidavit of 2005 (the DST AFFIDAVITS Brief Attachments AM, An and AO) state in paragraph 11 of each of these affidavits a person of ordinary skill in the art of fabrication of ceramic materials has a high level of training and skill and can fabricate these materials without undue experimentation. As stated in paragraph 10 of these affidavits considerably less training and skill is needed to test these materials for superconductivity properties.

The Examiner states at page 8 of the Final Action:

> Applicant has taken the position that the instant "apparatus" claims do not require the instant specification be fully enabled for the claimed superconductive compositions. At page 157 of the response filed *1/31/05,* applicant states "Notwithstanding, since the claims are apparatus and device claims, Applicants do not believe that they are required to provide a teaching of how to fabricate all compositions which may be used within the full scope of Applicant's claimed invention".

Applicants not that the Board in Ex parte Jackson Supra recognizes that enablement is different in different context when it says at 217 USPQ 808 "The problem of enablement of processes carried out by microorganisms were uniquely different from the field of chemistry generally."

The Examiner has mischaracterized Applicants' comments at page 157 of the response filed *1/31/0.* Applicants claims are not composition of matter claims, but are apparatus claims and required enablement is for apparatus claims which are, as explained above, of narrower scope than composition claims. Notwithstanding Applicants have shown extensive evidence that persons of skill in the art can make high Tc compositions without undue experimentation. The Examiner has acknowledged this, as described above, when the Examiner rejected composition claims as anticipated by

prior art. The claims under examination are a use of the high Tc property of those compounds that was discovered by Applicants. The Examiner has also acknowledged this rejection of Applicants' claims as obvious over the Asahi Shinbum article, as described above.

The Examiner further states at page 8 of the Final Action:

> The Examiner respectfully disagrees. The Examiner respectfully maintains that the instant claims must be enabled for all aspects of the claimed invention, including compositions utilized therein.

Poole 1988 (Brief Attachment AF and AW), as stated above, states that species within the scope of applicants claims "are not difficult to synthesize" and Poole 1995 (Brief Attachment Z) states that "the new superconductors do indeed possess [the] characteristics" that Applicants' specification describes these new superconductors to have. Thus the compositions and their use are enabled by Applicants' teaching.

The Examiner states at page 8 of the Final Action:

> Such is the basis of applicant's invention. The Examiner does not deny that the instant application includes "all know principles of ceramic science", or that once a person of skill in the art knows of a <u>specific type of composition which is superconducting</u> at greater than or equal to *26K,* such a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication known at the time the application was initially filed, can make the known superconductive compositions. The numerous 1.132 declarations, such as those of Mitzi, Shaw, Dinger and Duncombe, and the Rao article, are directed to production of know superconductive materials.

Thus the Examiner agreed that "a person of skill in the art, using the techniques described in the application, which included all principles of ceramic fabrication

known at the time the application was initially filed, can make the known superconductive compositions."

The Examiner states at page 8 of the Final Action

> What is not a "matter of routine experimentation" in this complex, unpredictable art is arriving at superconductive compositions outside the scope of the allowable claims (e.g., subsequently discovered BSCCO or Tl-systems as disclosed in Rao (see response filed 3/8/05, pages 141-143). The Examiner respectfully maintains that the instant disclosure has not provided sufficient guidance to produce such materials.

This statement is inconsistent with the evidence introduced by Applicant in particular Poole 1988 (Brief Attachment AF and AW) which states that species within the scope of applicants claims "are not difficult to synthesize" and Poole 1995 (Brief Attachment Z) states that "the new superconductors do indeed possess [the] characteristics" that Applicants' specification describes these new superconductors to have. Thus species within the scope of applicants' claims are determinable based on mere routine experimentation which the Board's decision in Ex parte Jackson Supra. states this is all that is needed for enablement.

A BSCCO compound is an acronym for a Bi-Sr-Ca-Cu-O compound. i.e. a bismuth-strontium-calcium-copper oxide compound. See article in Brief Attachment BJ from the on-line Wikepedia Encyclopedia. (This article was submitted with the "Ninth Supplemental Response submitted 11/06/2006 which has not been entered when this Brief was filed.)

The Examiner states referring to Poole 1988 (Brief Attachment AF and AW) at page 18 of Office Action dated 07/28/2004:

> Finally, the Preface states in part at A3: "The unprecedented worldwide effort in superconductivity research that has taken place over the past two years has produced an enormous amount of experimental data on the properties of the copper oxide type materials that exhibit superconductivity above the temperature of

liquid nitrogen. During this period a consistent experimental description of many of the properties of the principal superconducting compounds such as **BiSrCaCuO**, LaSrCuO, **TlBaCaCuO** and YBaCuO has emerged, The field of high-temperature superconductivity is still evolving ..." (Emphasis added.)

Poole 1988 specifically describes BSCCO and thallium (Tl) compounds.

As noted many times in the prosecution of this application Poole 1988 (See ¶ 48 of DST AFFIDAVITS Brief Attachments AM, AN and AO) states at page 59:

> [c]opper oxide superconductors with a purity sufficient to exhibit zero resistivity or to demonstrate levitation (Early) are not difficult to synthesize. We believe that this is at least partially responsible for the explosive worldwide growth in these materials.

Poole 1988 further states at page 61:

> [i]n this section three methods of preparation will be described, namely, the solid state, the coprecipitation, and the sol-gel techniques (Hatfi). The widely used solid-state technique permits off-the-shelf chemicals to be directly calcined into superconductors, and it requires little familiarity with the subtle physicochemical process involved in the transformation of a mixture of compounds into a superconductor.

Since skilled artisans can fabricate samples without knowing the "subtle physiochemical process involved" and without a detailed theory, this art is predictable.

In Applicants' SECOND SUPPLEMENTAL AMENDMENT submitted March 8, 2005 Applicants state in the paragraph bridging pages 153 and 154:

> Charles Poole et al. published another book in 1995 entitled "Superconductivity" Academic Press which has a Chapter 7 on "Perovskite and Cuprate Crystallographic Structures". (See Attachment Z). This book will be referred to as Poole 1995.
>
> At page 179 of Poole 1995 states:
>
> > V. PEROVSKITE-TYPE SUPERCONDUCTING STRUCTURES

> In their first report on high-temperature superconductors Bednorz and Muller (1986) referred to their samples as "metallic, oxygen-deficient ... perovskite-like mixed-valence copper compounds." Subsequent work has confirmed that the new superconductors do indeed possess these characteristics.

Thus Poole 1988 states that the high T_c superconducting materials "are not difficult to synthesize" and Poole 1995 states that "the new superconductors do indeed possess [the] characteristics" that Applicants' specification describes these new superconductors to have.

Poole 1995 is Brief Attachment Z and Poole 1988 is Brief Attachment AW.

Thus the BSCCO and thallium compounds referred to by the Examiner at page 8 of the Final Action, as quoted above, are described in Poole 1988 as being "not difficult to synthesize" and in Poole 1995 as having the properties that Applicants' teaching teaches they have. Thus Applicants teaching enables the BSCCO and thallium compounds referred to by the Examiner at page 8 of the Final Action.

The Examiner states referring to Poole 1988 (Brief Attachment AF and AW) at page 18 of Office Action dated 07/28/2004:

> Finally, the Preface states in part at A3: "The unprecedented worldwide effort in superconductivity research that has taken place over the past two years has produced an enormous amount of experimental data on the properties of the copper oxide type materials that exhibit superconductivity above the temperature of liquid nitrogen. During this period a consistent experimental description of many of the properties of the principal superconducting compounds such as **BiSrCaCuO**, LaSrCuO, **TlBaCaCuO** and YBaCuO has emerged, The field of high-temperature superconductivity is still evolving ..." (Emphasis added.)

Poole 1988 specifically describes BSCCO and thallium (Tl) compounds.

As noted many times in the prosecution of this application Poole 1988 (See ¶ 48 of DST AFFIDAVITS Brief Attachments AM, AN and AO) states at page 59:

> [c]opper oxide superconductors with a purity sufficient to exhibit zero resistivity or to demonstrate levitation (Early) are not difficult to synthesize. We believe that this is at least partially responsible for the explosive worldwide growth in these materials.

Poole 1988 further states at page 61:

> [i]n this section three methods of preparation will be described, namely, the solid state, the coprecipitation, and the sol-gel techniques (Hatfi). The widely used solid-state technique permits off-the-shelf chemicals to be directly calcined into superconductors, and it requires little familiarity with the subtle physicochemical process involved in the transformation of a mixture of compounds into a superconductor.

Since skilled artisans can fabricate samples without knowing the "subtle physiochemical process involved" and without a detailed theory, this art is predictable.

In Applicants' SECOND SUPPLEMENTAL AMENDMENT submitted March 8, 2005 Applicants state in the paragraph bridging pages 153 and 154:

Charles Poole et al. published another book in 1995 entitled "Superconductivity" Academic Press which has a Chapter 7 on "Perovskite and Cuprate Crystallographic Structures". (See Attachment Z). This book will be referred to as Poole 1995.

At page 179 of Poole 1995 states:

> V. PEROVSKITE-TYPE SUPERCONDUCTING STRUCTURES
> In their first report on high-temperature superconductors Bednorz and Muller (1986) referred to their samples as "metallic, oxygen-deficient ... perovskite-like mixed-valence copper compounds." Subsequent work has confirmed that the new superconductors do indeed possess these characteristics.

Thus Poole 1988 states that the high T_c superconducting materials "are not difficult to synthesize" and Poole 1995 states that "the new superconductors do indeed possess [the] characteristics" that Applicants' specification describes these new superconductors to have.

Poole 1995 is Brief Attachment Z and Poole 1988 is Brief Attachment AW.

Thus the BSCCO and thallium compounds referred to by the Examiner at page 8 of the Final Action, as quoted above, are described in Poole 1988 as being "not difficult to synthesize" and in Poole 1995 as having the properties that Applicants' teaching teaches they have. Thus Applicants teaching enables the BSCCO and thallium compounds referred to by the Examiner at page 8 of the Final Action.

Brief Attachment BL contains Pages E-85 to E-100 of the "CRC Handbook of Chemistry and Physics 59th Edition 1978-1979. This was submitted with the Fourteenth Supplemental Response submitted 10/25/2006 which was not entered when this Brief was submitted. Since the information in Brief Attachment BL was well know prior to Applicants' discovery, an Examiner of the superconductive materials art should not be unaware of this information. These pages list superconductive elements and materials having Tc less than 26 K.

Persons of ordinary skill in the art after Applicants' discovery would be motivated to look for other materials within the scope of Applicants non-allowed claims that would have the properties taught by Applicants and comprise elements shown to exhibit superconductivity at lower temperatures. For example, at page E-87, bottom table, Bi and Tl are listed as elements exhibiting superconductivity. Page E-85 refers to Type I and Type II superconductors. (See Newns Affidavit paragraphs 11 to 14 (Brief Attachment AO) which refers to Type I and Type II superconductors. Newns Affidavit paragraph 13 states that there are about 30 pure metals that are Type I superconductors.) The elements listed in both tables on page E-87 as being superconductors are: Al, Be, Bi, Cd, Ga (three forms $\beta \gamma \delta$), Hg (two forms $\alpha \beta$), In, La (two forms $\alpha \beta$) Mo, Nb, Os, Pa, Pb, Re, Ru, Sb, Sn, Ta, Ti, Tl, V, W, Zn and Zr. Pages E-89 to E-99 show compounds comprising Bi, Tl, Ca and Sr that exhibit superconductivity. Applicants specification teaches at page 7, lines 19-20. "Examples of suitable alkaline earths include Ca, Sr, and Ba,." at page 11, lines 7-8,. and at page 3, line 4 refers to "metallic oxides, such as the perovskite Ba-Pb-Bi-0 system" and at other locations. Thus Applicants teach Bi, Sr, Ca, Ca, C and O, the constituents of a BSCCO high Tc, composition. Thus since Applicants teach each of these elements Bi, Sr, Ca, Cu and O and since Tl and Bi and compounds thereof were, prior to Applicants' discovery, known superconductors at less than 26 K, persons of skill in the art would be motivated in view of Applicants' discovery and what was known to persons of skill in the art, as described in the affidavits of Brief Attachments AH to AP, to look for other materials within the scope of Applicants non-allowed claims that would have the properties taught by Applicants and comprise elements such as Bi, Sr, Ca, Cu, O and Tl (in particular any of the elements listed above from page E-87) to exhibit superconductivity at temperatures greater than or equal to 26 K.

At page 9 of the Final Action the Examiner states:

At page 125 of the response filed 1/31/05, applicant argues In re Fisher (166 USPQ 18) emphasizing "It is apparent that such an inventor should be allowed to dominate the future patentable inventions' of others where those inventions were based in some way on his teachings". The Examiner respectfully submits the remaining statements of Fisher are equally important:

> It is equally apparent, however, that he must not be committed to achieve this dominance be claims which are insufficiently supported and hence, not in compliance with the first paragraph of 35 USC 112. That paragraph requires the scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification to persons of ordinary skill in the art... In cases involving unpredictable factors such as most chemical reactions... the scope of enablement obviously varies inversely with the degree of unpredictability of the factors involved...

Applicants have submitted extensive evidence that they have fully enabled their claims and it is undisputed that as sated by Poole 1988 (Brief Attachment AF and AW) using techniques known prior to Applicants' discovery "'permits off-the-shelf chemicals to be directly calcined into superconductors, and it requires little familiarity with the subtle physicochemical process involved in the transformation of a mixture of compounds into a superconductor". As noted above an art is not unpredictable when species within the scope of the claim are determinable without undue experimentation. The Examiner has not made a prima facie showing that the art of high Tc superconductivity is unpredictable.

The Examiner states at page 10 of the Final Action:

> While applicant argues "domination", the issue of "reasonable correlation to the scope of enablement" is as important.
>
> At several instances the remarks, applicant has stated "In the present invention Applicants have provided a teaching (and proof thereof) of how to make all known high Tc materials useful to practice their claimed invention" (reply filed 1/31/05, page 152). The Examiner respectfully disagrees.

The Examiner states that he disagrees but provides no objective evidence for the disagreement. The Examiner doe not indicate species that come within the scope of Applicants' claims that cannot be made following Applicants' teaching, but which are in fact high Tc superconductors. Applicants do not have to foresee all species that come within the scope of the claims for those claims to be enabled.

The Examiner further states at page 10 of the Final Action:

> Applicant has provided an enabled disclosure for superconductive compositions containing a transition metal oxide containing at least a) an alkaline earth element and b) a rare-earth element of Group IIIE element (pages 5-8 of Rejection mailed 2/28/04).

Applicants disagree that their disclosure is so limited for the reasons given above.

The Examiner further states at page 10 of the Final Action:

> The fact that other subsequently discovered superconductive systems (such as BSCCQ) may be made by "general principles of ceramic science" does not provide enablement for the claimed invention. The state of the art for a given technology is not static in time. The state of the art must be evaluated based on the application filing date. Whether the specification would have been enabling as of the filing date involves consideration of the nature of the invention, the state of the prior art, and the level of skill in the art. The initial inquiry is into the nature of the

> invention, i.e., the subject matter to which the claimed invention pertains.

Applicants evidence clearly and unambiguously shows that only techniques known prior to applicants discovery and applicants teaching have been used to make species fabricated after Applicants discovery. The Examiner has not shown anything to the contrary. The Examiner has not done the referred to "involves consideration of ..." or the referred to "initial inquiry".

At page 11 of the Final Action the Examiner further states:

> The nature of the invention becomes the backdrop to determine the state of the art and the level of skill possessed by one skilled in the art. The state of the prior art is what one skilled in the art would have known, at the time the application was filed, about the subject matter to which the claimed invention pertains. A conclusion of lack of enablement means that, based on the evidence regarding each of the factors discussed in the rejection, the specification, at the time the application was filed, would not have taught one skilled in the art how to make and/or use the full scope of the claimed invention without undue experimentation.
>
> In re Wright, 999 F.2d 1557,1562, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993).

As described above In re Wright is directed to a biotechnology invention and as stated by the Board in Ex parte Jackson Supra, it does not apply, but In re Angstadt Supra and In re Geerdes Supra apply. It is clear from the evidence presented by Applicants that later developed species that come within the scope of Applicants' non-allowed claims are made by the same techniques taught by Applicants guided by what was know to a person of skill in the art, prior to Applicants discovery. See the DST AFFIDAVITS (Brief Attachments AM, AN and AO.) See Poole 1988 (Brief Attachments AF and AW). See Poole 1995)(Brief Attachment Z.) For a person of ordinary skill in the art to fabricate the later discovered species it is only necessary to use applicants teaching with what was known by a person of skill in the art at the time of Applicants' discovery. The

Examiner has not stated that the later discovered species cannot be made following applicants teaching with what was known by a person of skill in the artat the time of Applicants' discovery. Thus under In re Wright, as discussed above, Applicants have enables their claims.

The Examiner further states at page 11 of the Final Action:

> In discussing the Rao article at page 169 of the response filed 1/31/05, applicant states:
>
> > It thus is clear that broader claims than allowed should be allowed since it is clear that the allowed claims can be avoided following applicant's teaching without undue experimentation. Applicants are entitled to claims which encompass these materials since they were made following Applicants' teaching.
> >
> > The Examiner does not dispute that Rao acknowledges that applicant initiated the study of high temperature superconductivity, or that a large number of oxides are prepared by the general principles of ceramic science.
> >
> > However, the Examiner maintains that such superconductive compounds cannot be made by following applicants teaching without undue experimentation. These are materials subsequently discovered by others.

The Examiner states that the species identified in the Rao article not within the scope of the allowed claims "cannot be made by following applicants teaching without undue experimentation." But, the Examiner des not identify what the alleged undue experimentation is. What has to be done differently than taught by Applicants to fabricate these species? The DST AFFIDAVITS (Brief Attachments AM, An and AO) Poole 1988 (Brief Attachments AF and AW), Poole 1995 (Brief Attachment W), Poole 1996 (Brief Attachment AG) and Rao (Brief Attachment AB), clearly and unambiguously show that only Applicants teaching is needed to make these species. As described above the Schuller article, cited by the Examiner, supports Applicants' position. The Examiner has

made no comment on or rebutted the DST AFFIDAVITS. This is clearly established by the Examiner's earlier rejection of applicants claims as obvious over the Asahi Shinbum Article (Brief Attachment AV) as described above and the rejection of applicants initially presented composition of matter claims, as described above, as being inherent in the prior art.

The Examiner further estates at page 12 of the Final Action:

> Applicant are entitled to claims, apparatus or otherwise, which are fully enabled by the instant specification at the time of filing. For the reasons clearly set forth in the rejection, after carefully reviewing the instant disclosure including all examples and statements included therein, the Examiner respectfully maintains that the instant claims are enabled for superconductive compositions containing a transition metal oxide containing at least a) an alkaline earth element and b) a rare-earth element of Group IIIB element (pages 5-8 of Rejection mailed 2/28/04).

For the reasons above Applicants disagree.

The Examiner further states at page 12 of the Final Action:

> Additionally, applicant's remarks regarding the Asahi Shinbum article are noted (pages 178-180 of the remarks filed 1/31/05). Applicant contends "Since Applicant's original article is the only information enabling the Asahi Shinbum article, it logically follows that the Examiner necessarily concludes that all Applicant's claims are fully enabled". The Examiner respectfully disagrees. A careful review of the article discloses "an oxide compound of La and Cu with Barium which has a structure of the so-called perovskites". No specific stoichiometry is proposed.
>
> Even if this disclosure were available as a prior publication, the Examiner contends that the article may not be applied as operable prior art. The disclosure in an assertedly anticipating reference must provide an enabling disclosure of the desired subject matter; mere naming or description of the subject matter is insufficient, if it cannot be produced without undue experimentation. Elan Pharm., Inc. v. Mayo Foundation for Medical and Education Research, 346 F.3d 1051, 1054, 68 USPQ2d 1373, 1376 (Fed. Cir. 2003) .

Applicants note that the Examiner has never withdrawn the rejection of Applicants' claims (noted above) as obvious under 35 USC 103(a) over the Asahi Shinbum article. Applicants showed that they reduced their invention to practice prior to the publication date of the Asahi Shinbum article. To avoid the

rejection of Applicants' claims Applicants were only successful by swearing behind it. The Examiner would not agree that the Asahi Shinbum Article was not a reference under 35 USC 102. This is the current state of the prosecution of this rejection. Until the Examiner states that the Asahi Shinbum article is not a reference under 35 USC 102, Applicants' arguments unambiguously show that the Examiner must necessarily be of the view that all of Applicants' claims are fully enabled. As noted above the Examiner maintained the rejections under 35 USC 102 and 103 since 1992 (about 14 years) in the prosecution of this and the ancestral applications. The Examiner appears to be stating that notwithstanding having maintained this rejection for 14 years, the Examiner has now decided after "[a] careful review of the article discloses 'an oxide compound of La and Cu with Barium which has a structure of the so-called perovskites'. No specific stoichiometry is proposed. Even if this disclosure were available as a prior publication, the Examiner contends that the article may not be applied as operable prior art." This statement is directly contradictory to the 35 USC 103 rejections for obviousness over the Asahi Shinbum Article. If the Examiner is now of the view that the Asahi Shinbum Article is not a valid reference, Applicants should not be required to rely on their affidavits to avoid it as a reference. The Examiner should formally enter in the record a statement withdrawing the 35 USC 103 and 102 rejections in view of the Asahi Shinbum Article because it is not a reference under 35 USC 102. It is clear from Applicants' evidence that only routine experimentation is needed to practice Applicants' non-allowed claims.

The Examiner further estates at page 13 of the Final Action:

> With respect to applicants remarks regarding portions of the file history, applicant contends that the prior art rejections in parent application 07/053,307 (composition claims), conclusively lead to the conclusion ",..all of the instant claims are fully enabled because the Examiner has stated that the compositions of matter recited in the claims may be made with the knowledge of a person of skill in the art prior to Applicant's filing date" (pages 181-183 of the remarks filed 1/31/05) .

> Again, the Examiner respectfully disagrees. It appears that the references were cited and applied as inherently possessing the claimed superconductive characteristics. They have no disclosure relating to superconductivity, and appear to have little or no bearing on the scope of enablement issues of the instant claims. As stated above, the Examiner sincerely believes that the above remarks address each of applicant's concerns set forth in the Petition filed 1/31/05, as well as the additional remarks and attachment filed subsequently.

Applicants respectfully disagree with the Examiners conclusion. It is true that the references, some of which are incorporated herein by reference in Applicants' specification, "were cited and applied as inherently possessing the claimed superconductive characteristics [and that T]hey have no disclosure relating to superconductivity." "To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently." In re Schreiber, 128 F.3d 1473, 1477 (Fed. Cir. 1997), 44 U.S.P.Q.2D (BNA) 1429

"To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. In re Oelrich, 666 F.2d 578, 581, 212 U.S.P.Q. (BNA) 323, 326 (CCPA 1981) (quoting Hansgirg v. Kemmer, 26 C.C.P.A. 937, 102 F.2d 212, 214, 40 U.S.P.Q. (BNA) 665, 667 (CCPA 1939)) provides:

Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. [Citations omitted.] If, however, the disclosure is sufficient to show that the natural result flowing from the operation as taught would result in the performance of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient." Continental Can Co. v. Monsanto Co., 948 F.2d 1264, 1268-

1269 (Fed. Cir. 1991). Thus when the Examiner rejected Applicants' composition claims because the high Tc property was inherent in the teaching of the cited prior art references, the Examiner was acknowledging that persons of skill in the art prior to Applicants earliest filing date knew how to make samples having the high Tc property which necessarily means that persons of skill in the art knew how to make their compositions. The Examiner does not explain how an apparatus, that uses a composition that a skilled artisan knows how to make, can not be enabled.

SUMMARY OF THE QUESTIONS RAISED BY THIS PROSECUTION

A number of Applicants' claims have been rejected under 35 USC 112, first paragraph, as not enabled by Applicants' specification. The Examiner has given these reasons in support of this rejection: 1) the Examiner's unsupported statements that the art of high T_c superconductivity is unpredictable; 2) the Examiner's statement that the theory of high T_c superconductivity is not well understood; and 3) the Examiner points to examples cited in Applicants' specification which do not show superconductivity greater than or equal to 26ºK. The Examiner has provided no support for reason 1. The only support the Examiner has provided for reason 2 is the article of Schuller which as shown by Applicant support Applicants' position that their claims are enabled. Schuller clearly states that systematic searches guided by chemical and materials intuition using well-defined empirical strategies and searches in the oxides gave rise to many high Tc superconducting systems, that is through routine experimentation. Schuller also states that similar searches bused on M_gB_2 have been done, thereby being enabled even though not finding as many high Tc species. The Examiner cited no authority to support the Examiner's view that a well developed theory is necessary to support enablement. Thus, reasons 1 and 2 are the Examiner's unsupported opinion. Applicants' examples that do not have a T_c greater than or equal to 26ºK (Reason 3) do not support the Examiner's lack of

enablement rejection in view of the decisions cited by Applicants, in particular, In re Angstadt, Amgen v. Chugai Pharmaceutical Co. and In re Wands. Applicants have provided extensive evidence in support of their view that their claims are enabled: 1) the five initial affidavits of Tsuei, Dinger, Duncombe, Shaw and Mitzi and the three additional extensive DST AFFIDAVITS 2) the books and articles cited in these affidavits, 3) Poole 1988 that states that the reason so much work was done in such a short period of time after Applicants' first discovery was that the high T_c materials were easy to make using well known fabrication techniques, 4) the article of Rao et al. entitled "Synthesis of Cuprate Superconductors" which cite numerous species of high T_c materials which can be made according to Applicants' teaching; 5) the CRC Handbook of Chemistry and Physics which cites numerous species of high T_c materials which can be made according to Applicants' teaching; 6) the Poole 1995 which states that the high Tc materials are layered perovskites as Applicants states they were in their initial publication for which they received the 1987 Nobel Prize; 7) and Poole 1996 which shows that the physical properties of the high Tc superconductors are consistent with there description in Applicants' specification Many of the species in 4 and 5 (Rao Article) (Handbook of Chemistry and Physics) are not specifically recited in Applicants' specification, but they come within the genus of Applicants' claims that have been rejected as not enabled. Moreover, there is no evidence of record that a person of skill in the art cannot, without undue experimentation, make these species following Applicants' teaching. The Examiner has not denied that Applicants extensive proof shows that a person of skill in the art can fabricate these species following Applicants' teaching. Under In re Angstadt and In re Wards it is Examiner's burden to establish that undue experimentation is needed to practice Applicants' claimed invention. The Examiner has made no attempt to satisfy this burden.

As stated all of Applicants' claims except for one (claim 123) were initially rejected in the final rejection of the parent application as anticipated or obvious over the Asahi Shinbum article under 35 USC 102 and 103. These rejections

were found moot in view of the Examiner agreeing that Applicants effectively swore behind the date of this article. The Examiner has not withdrawn the 35 USC 102 and 103 rejections. Thus as alleged by Applicants from very early in the prosecution of this application, by these rejections, the Examiner has necessarily and unambiguously found all of Applicants' claims enabled. As stated, the Asahi Shinbum article [Brief Attachment AV] derives its enablement from Applicants' publication [Attachment AX] which was published less than a year before Applicants' filing date and which is incorporated by reference in Applicants' specification. For a reference to anticipate a claimed invention the reference must enable from the teaching therein a person of skill in the art to practice the alleged anticipated claims and for a single reference to render obvious a claimed invention the single reference must enable a person of skill in the art to practice the alleged obvious claims from the teaching of that reference in combination with what is know to a person of skill in the art. Thus, all of Applicants' claims that were rejected under 35 USC 102 and 103 over the Asahi Shinbum article must be fully enabled by the Examiner's own rational. Moreover, the Examiner rejected applicants composition claims as inherent in the prior art. This means that persons of skill in the art knew how to make these materials. Thus all of Applicants' claims rejected as not enabled are in fact enabled since the non-obvious use of an enabled compound must be enabled.

More specifically, Applicants see no justifiable reason to reject as not enabled Applicants' claims which specifically recite, or that can be amended to recite, that the element having a Tc ≥26K "can be made according to known principles of ceramic science" since there is no evidence that such species cannot be made following Applicants' teaching. As stated above, the sentenced bridging page 1 and 2 of the specification states "Generally, superconductivity is considered to be a property of the metallic state of a material since all known superconductors are metallic under the conditions that cause them to be superconducting. A few normally non-metallic materials, for example, become superconducting under very high pressure wherein the pressure converts them to metals before they exhibit

superconducting behavior." Applicants discovered that ceramic materials are superconductors. Their work lead others to look for other species. Applicants' evidence shows that those others used Applicants teaching to determine those species. Thus following In re Fisher "It is apparent that such an inventor should be allowed to dominate the future patentable inventions of others where those inventions were based in some way on his teachings." (166 USPQ 18, 24)

Applicants request the Board to reverse the Examiner's rejection of Applicants claims as not enabled under 35 USC 112, first paragraph.

Part VIII

Claims Appendix

Part IX
Evidence Appendix

The evidence relied in are:

Brief Attachments A to and AA	which are in the record as Attachments A to Z and AA of Applicants' paper entitled "First Supplemental Amendment" dated March 1, 2005 in response to Office Action dated July 28, 2004 was entered by the Office Action dated October 10, 2005.
Brief Attachments AB to AG	which are in the record as Attachments AB to AG of Applicants' paper entitled "Third Supplemental Amendment" dated March 14, 2005 in response to Office Action dated July 28, 2004 was entered by the Office Action dated October 10, 2005.
Brief Attachment AH	is in the record as Attachment 16 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 which was entered by Office Action dated July 28, 2004.
Brief Attachment AI	is in the record as Attachment 17 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000

which was entered by Office Action dated July 28, 2004.

Brief Attachment AJ	is in the record as Attachment 18 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 which was entered by Office Action dated July 28, 2004.
Brief Attachment AK	is in the record as Attachment 19 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 which was entered by Office Action dated July 28, 2004.
Brief Attachment AL	is in the record as Attachment 20 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 which was entered by Office Action dated July 28, 2004.
Brief Attachment AM	is in the record as an Attachment of Applicants' paper entitled "Sixth Supplemental Amendment" dated April 14, 2005 in response to the Office Action dated October 20, 2005.
Brief Attachment AN	is in the record as an Attachment of Applicants' paper entitled "Sixth Supplemental

Amendment" dated April 5, 2005 in response to the Office Action dated July 28, 2004 was entered by Office Action dated October 20, 2005.

Brief Attachment AO	is in the record as an Attachment of Applicants' paper entitled "Sixth Supplemental Amendment" dated April 5, 2005 in response to the Office Action dated July 28, 2004 was entered by Office Action dated October 20, 2005.
Brief Attachment AP	is in the record as an Attachment of Applicants' paper entitled "Second Amendment After Final Rejection" dated April 12, 2006 in response to the Office Action dated October 20, 2005 was entered by Advisory Action dated May 19, 2006.
Brief Attachment AQ	is in the record as an Attachment of Applicants' paper entitled "Second Amendment After Final Rejection" dated April 12, 2006 in response to the Office Action dated October 20, 2005 was entered by Advisory Action dated May 19, 2006.
Brief Attachment AR	is in the record as Attachment 57 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.

Brief Attachment AS	is in the record as Attachment 37 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment AT	is in the record as Attachment 42 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment AU	is a copy of Applicants' first Ancestral Application U.S. Application Serial No.: 07/053,307, filed May 22, 1987.
Brief Attachment AV	is in the record as Attachment 6 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment AW	is in the record as Attachment 23 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.

Brief Attachment AX	is in the record as Attachment 73 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment AY	is a reference cited by the Examiner with Office Action dated October 20, 2005.
Brief Attachment AZ	is a reference cited by the Examiner with Office Action dated October 20, 2005.
Brief Attachment BA	is in the record as Attachment 43 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment BB	is in the record as Attachment 49 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment BC	is in the record as Attachment 50 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.

Brief Attachment BD	is in the record as Attachment 51 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment BE	is in the record as Attachment 52 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment BF	is in the record as Attachment 53 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment BG	is in the record as Attachment 54 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment BH	is in the record as Attachment 55 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.

Brief Attachment BI	is in the record as Attachment 56 of Applicants' paper entitled "Fifth Supplemental Amendment" dated March 1, 2004 in response to the Office Action dated February 4, 2000 was entered by Office Action dated July , 2004.
Brief Attachment BJ	is in the record as an Attachment to Applicants' paper entitled "Eleventh Supplemental Amendment" dated November 14, 2006 in response to the Office Action dated October 20, 2005 this is not entered as of the submission of this brief.
Brief Attachment BK	is in the record as an Attachment to Applicants' paper entitled "Fourteenth Supplemental Response" dated November 25, 2006 in response to the Office Action dated October 20, 2005 this is not entered as of the submission of this brief.
Brief Attachment BL	is in the record as an Attachment to Applicants' paper entitled "Fourteenth Supplemental Response" dated November 25, 2006 in response to the Office Action dated October 20, 2005 this is not entered as of the submission of this brief.

Brief Attachments A to Z are in a separate paper entitled:

PART IX

CFR 37 § 41.37(c) (1) *(ix)*

SECTION 1

BRIEF ATTACHMENTS A TO Z

Brief Attachments AA to AZ and BA to BJ are in a separate paper entitled:

PART IX

CFR 37 § 41.37(c) (1) *(ix)*

SECTION 1

BRIEF ATTACHMENTS AA TO AZ; BB TO BI

Part X
Related Proceeding Appendix

There are no prior or pending appeals, interferences or related proceedings related to this application to Appellant's knowledge. Copending parent Application Serial Number 08/303,561 filed 09-Sep-1994 has been suspended pending the outcome of this appeal since essentially the same issues are presented therein. The present Application Serial Number 08/479,810 is a Continuation of Application Serial 08/303,561 filed 09/09/94 which is a Continuation of Application Serial Number 08/060,470 filed 05//11/93 which is a Continuation of Application Serial Number 08/875,003 filed 04/25/92 which is a Division of Application Serial Number 07/053,307 filed 05/22/87 (all referred to herein as The Ancestral Applications of the present application.)

Part VIII
Claims Appendix

Since

- The Response After Final Rejection submitted (11/21/2006) entitled "Twelfth Supplemental Response" added dependent claims 544 to 550 the text of which is found in allowed claims. This Response After Final Rejection has not been responded to with an Advisory Action at the time of submission of this Brief. Dependent claims 544 to 550 add language of the type "wherein said superconductor can be made according to known principles of ceramic science;" and

- The Response After Final Rejection submitted (11/25/2006) entitled "Thirteenth Supplemental Response" corrected typographical errors in the claims and modified language in claims to be in agreement with corresponding language in allowed claims. This Response After Final Rejection has not been responded to with an Advisory Action at the time of submission of this Brief

- The Response After Final Rejection submitted (11/27/2006) entitled "Fifteenth Supplemental Response" corrected typographical errors in the claims and modified language in claims to be in agreement with corresponding language in allowed claims. This Response After Final Rejection has not been responded to with an Advisory Action at the time of submission of this Brief

The following two claim appendices are being included:

- Claim Appendix A which includes the claim changes in the two Response After Final Rejection identified above; and
- Claim Appendix B which **does not** includes the claim changes in the two Response After Final Rejection identified above.

Part VIII
Claims Appendix A

CLAIM 1 A superconducting apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or rare earth-like element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at said temperature to exhibit said superconductivity and a current source for passing an electrical superconducting current through said composition while exhibiting said superconductivity.

CLAIM 2 The superconducting apparatus of claim 1, further including an alkaline earth element substituted for at least one atom of said rare earth or rare earth-like element in said composition.

CLAIM 3 The superconducting apparatus of claim 2, where said transition metal is Cu.

CLAIM 4 The superconducting apparatus of claim 3, where said alkaline earth element is selected from the group consisting of B, Ca, Ba, and Sr.

CLAIM 5 The superconducting apparatus of claim 1, where said transition metal element is selected from the group consisting of Cu, Ni, and Cr.

CLAIM 6 The superconducting apparatus of claim 2, where said rare earth or rare earth-like element is selected from the group consisting of La, Nd, and Ce.

CLAIM 7 The superconducting apparatus of claim 1, where said phase is crystalline with a perovskite-like structure.

CLAIM 8 The superconducting apparatus of claim 2, where said phase is crystalline with a perovskite-like structure.

CLAIM 9 The superconducting apparatus of claim 1, where said phase exhibits a layer-like crystalline structure.

CLAIM 10 The superconducting apparatus of claim 1, where said phase is a mixed copper oxide phase.

CLAIM 11 The superconducting apparatus of claim 1, where said composition is comprised of mixed oxides with alkaline earth doping.

CLAIM 12 A superconducting combination, comprising a superconductive oxide having a transition temperature greater than or equal to 26°K,

a current source for passing a superconducting electrical current through said composition while said composition is at a temperature greater than or equal to 26°K and less than said transition temperature, and

a temperature controller for cooling said composition to a superconducting state at a temperature greater than or equal to 26°K.

CLAIM 13 The combination of claim 12, where said superconductive composition includes a transition metal oxide.

CLAIM 14 The combination of claim 12, where said superconductive composition includes Cu-oxide.

CLAIM 15 The combination of claim 12, where said superconductive composition includes a multivalent transition metal, oxygen, and at least one additional element.

CLAIM 16 The combination of claim 15, where said transition metal is Cu.

CLAIM 17 The combination of claim 15, where said additional element is a rare earth or rare earth-like element.

CLAIM 18 The combination of claim 15, where said additional element is an alkaline earth element.

CLAIM 19 The combination of claim 12, where said composition includes a perovskite-like superconducting phase.

CLAIM 20 The combination of claim 12, where said composition includes a substituted transition metal oxide.

CLAIM 21 The combination of claim 20, where said substituted transition metal oxide includes a multivalent transition metal element.

CLAIM 22 The combination of claim 20, where said substituted transition metal oxide is an oxide of copper.

CLAIM 23 The combination of claim 20, where said substituted transition metal oxide has a layer-like structure.

CLAIM 24 An apparatus comprising:

a transition metal oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to of 26°K,

a temperature controller for lowering the temperature of said material at least to said critical temperature to produce said superconducting state in said phase, and

a current source for passing an electrical superconducting current through said transition metal oxide while it is in said superconducting state.

CLAIM 25 The apparatus of claim 24, where said transition metal oxide is comprised of a transition metal capable of exhibiting multivalent states.

CLAIM 26 The apparatus of claim 24, where said transition metal oxide is comprised of a Cu oxide.

CLAIM 27 A superconducting apparatus comprising a composition having a transition temperature greater than or equal to 26°K, said composition being a substituted Cu-oxide including a superconducting phase having a structure which is structurally substantially similar to the orthorhombic-tetragonal phase of said composition, a temperature controller for maintaining said composition at a temperature greater than or equal to said transition temperature to put said composition in a superconducting state; and a current source for passing current through said composition while in said superconducting state.

CLAIM 28 The superconducting apparatus of claim 27, where said substituted Cu-oxide includes a rare earth or rare earth-like element.

CLAIM 29 The superconducting apparatus of claim 27, where said substituted Cu-oxide includes an alkaline earth element.

CLAIM 30 The superconducting apparatus of claim 29, where said alkaline earth element is atomically large with respect to Cu.

CLAIM 31 The superconducting apparatus of claim 27, where said composition has a crystalline structure which enhances electron-phonon interactions to produce superconductivity at a temperature greater than or equal to 26°K.

CLAIM 32 The superconducting apparatus of claim 31, where said crystalline structure is layer-like, enhancing the number of Jahn-Teller polarons in said composition.

CLAIM 33 A superconducting apparatus comprising a composition having a superconducting onset temperature greater than or equal to 26°K, the composition being comprised of a copper oxide doped with an alkaline earth element where the concentration of said alkaline earth element is near to the concentration of said alkaline earth element where the superconducting copper oxide phase in said composition undergoes an orthorhombic to tetragonal structural phase transition.

CLAIM 34 A superconducting apparatus having a superconducting onset temperature greater than or equal to 26°K, the composition being comprised of a mixed copper oxide doped with an element chosen to result in Cu^{3+} ions in said composition and a current source for passing a superconducting current through said superconducting composition.

CLAIM 35 The superconducting apparatus of claim 34, where said doping element includes an alkaline earth element.

CLAIM 36 A combination comprising:

a composition having a superconducting onset temperature greater than or equal to 26°K, said composition being comprised of a substituted copper oxide

exhibiting mixed valence states and at least one other element in its crystalline structure,

a current source for passing a superconducting electrical current through said composition while said composition is at a temperature greater than or equal to 26°K and less than said superconducting onset temperature, and

a temperature controller for cooling said composition to a superconducting state at a temperature greater than or equal to 26°K.

CLAIM 37 The combination of claim 36, where said at least one other element is an alkaline earth element.

CLAIM 38 The combination of claim 36, where said at least one other element is an element which results in Cu^{3+} ions in said composition.

CLAIM 39 The combination of claim 36, where said at least one other element is an element chosen to result in the presence of both Cu^{2+} and Cu^{3+} ions in said composition.

CLAIM 40 An apparatus comprising a superconductor exhibiting a superconducting onset at an onset temperature greater than or equal to 26°K, said superconductor being comprised of at least four elements, none of which is itself superconducting at a temperature greater than or equal to 26°K, a temperature controller for maintaining said superconductor at an operating temperature in excess of said onset temperature to maintain said superconductor in a superconducting state and a current source for passing current through said superconductor while in said superconducting state.

CLAIM 41 The apparatus of claim 40, where said elements include a transition metal and oxygen.

CLAIM 42 A apparatus having a superconducting onset temperature greater than or equal to 26°K, said superconductor being a doped transition metal oxide, where said transition metal is itself non-superconducting and a current source for passing a superconducting electric current through said composition.

CLAIM 43 The apparatus of claim 42, where said doped transition metal oxide is multivalent in said superconductor.

CLAIM 44 The apparatus of claim 42, further including an element which creates a mixed valent state of said transition metal.

CLAIM 45 The apparatus of claim 43, where said transition metal is Cu.

CLAIM 46 An apparatus having a superconductor having a superconducting onset temperature greater than or equal to 26°K, said superconductor being an oxide having multivalent oxidation states and including a metal, said oxide having a crystalline structure which is oxygen deficient and a current source for passing a superconducting electric current through said superconductor.

CLAIM 47 The apparatus of claim 46, where said transition metal is Cu.

CLAIM 48 A superconductive apparatus comprising a superconductive composition comprised of a transition metal oxide having substitutions therein, the amount of said substitutions being sufficient to produce sufficient electron-phonon interactions in said composition that said composition exhibits a superconducting onset at temperatures greater than or equal to 26°K, and a source of current for passing a superconducting electric current through said superconductor.

CLAIM 49 The superconductive apparatus of claim 48, where said transition metal oxide is multivalent in said composition.

CLAIM 50 The superconductive apparatus of claim 48, where said transition metal is Cu.

CLAIM 51 The superconductive apparatus of claim 48, where said substitutions include an alkaline earth element.

CLAIM 52 The superconductive apparatus of claim 48, where said substitutions include a rare earth or rare earth-like element.

CLAIM 53 A superconductive apparatus comprised of a copper oxide having a layer-like crystalline structure and at least one additional element substituted in said crystalline structure, said structure being oxygen deficient and exhibiting a superconducting onset temperature greater than or equal to 26°K.

CLAIM 54 The superconductor of claim 53, where said additional element creates a mixed valent state of said copper oxide in said superconductor.

CLAIM 55 A combination, comprising:

a transition metal oxide having an superconducting onset temperature greater than about 26°K and having an oxygen deficiency, said transition metal being non-superconducting at said superconducting onset temperature and said oxide having multivalent states,

a current source for passing an electrical superconducting current through said oxide while said oxide is at a temperature greater than or equal to 26°K, and

a temperature controller for cooling said oxide in a superconducting state at a temperature greater than or equal to 26°K.

CLAIM 56 The combination of claim 55, where said transition metal is Cu.

CLAIM 57 A combination including;

a superconducting oxide having a superconducting onset temperature greater than or equal to 26°K and containing at least 3 elements which are non-superconducting at said onset temperature,

a current source for passing a superconducting current through said oxide while said oxide is maintained at a temperature greater than or equal to 26°K, and

a temperature controller for maintaining said oxide in a superconducting state at a temperature greater than or equal to 26°K and less than said superconductive onset temperature.

CLAIM 58 A combination, comprised of:

a copper oxide superconductor having a superconductor onset temperature greater than about 26°K including an element which results in a mixed valent state in said oxide, said oxide being crystalline and having a layer-like structure,

a current source for passing a superconducting current through said copper oxide while it is maintained at a temperature greater than or equal to 26°K and less than said superconducting onset temperature, and

a temperature controller for cooling said copper oxide to a superconductive state at a temperature greater than or equal to 26°K and less than said superconducting onset temperature.

CLAIM 59 A combination, comprised of:

a ceramic-like material having an onset of superconductivity at an onset temperature greater than or equal to 26°K,

a current source for passing a superconducting electrical current through said ceramic-like material while said material is maintained at a temperature greater than or equal to 26°K and less than said onset temperature, and

a temperature controller for cooling said superconducting ceramic-like material to a superconductive state at a temperature greater than or equal to 26°K and less than said onset temperature, said material being superconductive at temperatures below said onset temperature and a ceramic at temperatures above said onset temperature.

CLAIM 60 An apparatus comprised of a transition metal oxide, and at least one additional element, said superconductor having a distorted crystalline structure characterized by an oxygen deficiency and exhibiting a superconducting onset temperature greater than or equal to of 26°K, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature at a temperature greater than or equal to 26°K.

CLAIM 61 The apparatus of claim 60, where said transition metal is Cu.

CLAIM 62 An apparatus comprised of a transition metal oxide and at least one additional element, said superconductor having a distorted crystalline structure characterized by an oxygen excess and exhibiting a superconducting onset temperature greater than or equal to 26°K, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling

apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature greater than or equal to of 26°K.

CLAIM 63 The apparatus of claim 62, where said transition metal is Cu.

CLAIM 64 A combination, comprising:

a mixed copper oxide composition having enhanced polaron formation, said composition including an element causing said copper to have a mixed valent state in said composition, said composition further having a distorted octahedral oxygen environment leading to a T_c greater than or equal to 26°K,

a current source for providing a superconducting current through said composition at temperatures greater than or equal to 26°K and less than said T_c, and

a temperature controller for cooling said composition to a temperature greater than or equal to 26°K and less than said T_c.

CLAIM 65 (ALLOWED) An apparatus comprising a composition exhibiting superconductivity at temperatures greater than or equal to 26°K, said composition being a ceramic-like material in the RE-AE-TM-O system, where RE is a rare earth or near rare earth element, AE is an alkaline earth element, TM is a multivalent transition metal element having at least two valence states in said composition, and O is oxygen, the ratio of the amounts of said transition metal in said two valence states being determined by the ratio RE : AE, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature greater than or equal to 26°K.

CLAIM 66 An apparatus comprising a superconductive composition having a transition temperature greater than or equal to 26°K, the composition including a multivalent transition metal oxide and at least one additional element, said composition having a distorted orthorhombic crystalline structure, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature greater than or equal to 26°K.

CLAIM 67 The apparatus of claim 66, where said transition metal oxide is a mixed copper oxide.

CLAIM 68 The apparatus of claim 67, where said one additional element is an alkaline earth element.

CLAIM 69 A superconductive combination, comprising:

a superconducting composition exhibiting a superconducting transition temperature greater than or equal to 26°K, said composition being a transition metal oxide having a distorted orthorhombic crystalline structure, and

a current source for passing a superconducting electrical current through said composition while said composition is at a temperature greater than or equal to 26°K and less than said superconducting transition temperature.

CLAIM 70 The combination of claim 69, where said transition metal oxide is a mixed copper oxide.

CLAIM 71 The combination of claim 70, where said mixed copper oxide includes an alkaline earth element.

CLAIM 72 The combination of claim 71, where said mixed copper oxide further includes a rare earth or rare earth-like element.

CLAIM 73 (WITHDRAWN) An apparatus comprising a composition of matter comprising a superconducting onset temperature greater than or equal to 26°K, said composition of matter made by a method comprising the steps of:

preparing powders of oxygen-containing compounds of a rare earth or rare earth-like element, an alkaline earth element, and copper,

mixing said compounds and firing said mixture to create a mixed copper oxide composition including said alkaline earth element and said rare earth or rare earth-like element, and

annealing said mixed copper oxide composition at an elevated temperature less than about 950°C in an atmosphere including oxygen to produce a superconducting composition having a mixed copper oxide phase exhibiting a superconducting onset temperature greater than or equal to 26°K, said superconducting composition having a layer-like crystalline structure after said annealing step.

CLAIM 74 (WITHDRAWN) The method of claim 73, where the amount of oxygen incorporated into said composition is adjusted by said annealing step, the amount of oxygen therein affecting the critical temperature T_c of the superconducting composition.

CLAIM 75 (WITHDRAWN) An apparatus comprising a composition of matter for carrying a superconductive current comprising a superconducting onset temperature greater than or equal to 26°K, said superconductor being comprised of a rare earth or rare earth-like element (RE), an alkaline earth element (AE), copper (CU), and oxygen (O) and having the general formula RE-AE-CU-O, said

composition being made by a method including the steps of combining said rare earth or rare earth-like element, said alkaline earth element and said copper in the presence of oxygen to produce a mixed copper oxide including said rare earth or rare earth-like element and said alkaline earth element therein, and

heating said mixed copper oxide to produce a superconductor having a crystalline layer-like structure and exhibiting a superconducting onset temperature greater than or equal to 26°K the critical transition temperature of said superconductor being dependent on the amount of said alkaline earth element therein.

CLAIM 76 (WITHDRAWN) The apparatus of claim 75, where said heating step is done in an atmosphere including oxygen.

CLAIM 77 (ALLOWED) A combination, comprising:

a mixed copper oxide composition including an alkaline earth element (AE) and a rare earth or rare earth-like element (RE), said composition having a layer-like crystalline structure and multi-valent oxidation states, said composition exhibiting *a* substantially zero resistance to the flow of electrical current therethrough when cooled to a superconducting state at a temperature greater than or equal to 26°K, said mixed copper oxide having a superconducting onset temperature greater than or equal to 26°K, and

a current source for passing an electrical superconducting current through said composition when said composition exhibits substantially zero resistance at a temperature greater than or equal to 26°K and less than said onset temperature.

CLAIM 78 (ALLOWED) The combination of claim 77, where the ratio (AE,RE) : Cu is substantially 1:1.

CLAIM 79 (ALLOWED) The combination of claim 77, where the ratio (AE,RE) : Cu is substantially 1:1.

CLAIM 80 (ALLOWED) The combination of claim 77, wherein said crystalline structure is perovskite-like.

CLAIM 81 (ALLOWED) The combination of claim 77, where said mixed copper oxide composition has a non-stoichiometric amount of oxygen therein.

CLAIM 82 (WITHDRAWN) An apparatus comprising a superconductor comprising a superconducting onset temperature greater than or equal to 26°K, said superconductor being comprised of a rare earth or rare earth-like element (RE), an alkaline earth element (AE), a transition metal element (TM), and Oxygen (O) and having the general formula RE-AE-TM-O, said superconductor being made by a method including the steps of combining said rare earth or rare earth-like element, said alkaline earth element and said transition metal element in the presence of oxygen to produce a mixed transition metal oxide including said rare earth or rare earth-like element and said alkaline earth element therein, and

heating said mixed transition metal oxide to produce superconductor having a crystalline layer-like structure and exhibiting a superconducting onset temperature greater than or equal to 26°K, said superconductor having a non-stoichiometric amount of oxygen therein.

CLAIM 83 (WITHDRAWN) The apparatus of claim 82, where said transition metal is copper.

CLAIM 84 A superconducting combination, comprising:

a mixed transition metal oxide composition containing a non-stoichiometric amount of oxygen therein, a transition metal and at least one additional element, said composition having substantially zero resistance to the flow of electricity therethrough when cooled to a superconducting state at a temperature greater than or equal to 26°K, said mixed transition metal oxide has a superconducting onset temperature greater than or equal to 26°K, and

a current source for passing an electrical superconducting current through said composition when said composition is in said superconducting state at a temperature greater than or equal to 26°K, and less than said superconducting onset temperature.

CLAIM 85 The combination of claim 84, where said transition metal is copper.

CLAIM 86 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or rare earth-like element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting onset temperature greater than or equal to 26°K,

a temperature controller for maintaining said composition to said superconducting state at a temperature greater than or equal to 26°K and less than said superconducting onset temperature, and

a current source for passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 87 (ALLOWED) The apparatus of claim 86, where said transition metal is copper.

CLAIM 88 An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a cooler for cooling said composition to a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a current source for passing an electrical current through said composition while said composition is in said superconductive state.

CLAIM 89 The apparatus of claim 88, where said composition is comprised of a metal oxide.

CLAIM 90 The apparatus of claim 88, where said composition is comprised of a transition metal oxide.

CLAIM 91 A combination, comprising:

a composition exhibiting the onset of a DC substantially zero resistance state at an onset temperature in excess of 30°K, and

a current source for passing an electrical current through said composition while it is in said substantially zero resistance state.

CLAIM 92 The combination of claim 91, where said composition is a copper oxide.

CLAIM 93 An apparatus, comprising:

a mixed copper oxide material exhibiting an onset of superconductivity at an onset temperature greater than or equal to 26°K, and

a current source for producing an electrical current through said copper oxide material while it is in a superconducting state at a temperature greater than or equal to 26°K.

CLAIM 94 The apparatus of claim 93, where said copper oxide material exhibits a layer-like crystalline structure.

CLAIM 95 The apparatus of claim 93, where said copper oxide material exhibits a mixed valence state.

CLAIM 96 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition comprising a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source for causing an electric current to flow in the superconductor element.

CLAIM 97 (ALLOWED) The superconductive apparatus according to claim 96 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or rare-earth-like element and at least one alkaline-earth element.

CLAIM 98 (ALLOWED) The superconductive apparatus according to claim 97 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 99 (ALLOWED) The superconductive apparatus according to claim 97 in which the alkaline-earth element is barium.

CLAIM 100 The superconductive apparatus according to claim 96 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 101 The superconductive apparatus according to claim 100 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 102 The superconductive apparatus according to claim 101 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 103 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition having a superconductive/resistive

transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$ of the superconductive composition; and

(c) a current source for causing an electric current to flow in the superconductor element.

CLAIM 104 (ALLOWED) The superconductive apparatus according to claim 103 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 105 (ALLOWED) The superconductive apparatus according to claim 103 in which the alkaline-earth element is barium.

CLAIM 106 (ALLOWED) The superconductive apparatus according to claim 103 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 107 (ALLOWED) The superconductive apparatus according to claim 106 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 108 (ALLOWED) The superconductive apparatus according to claim 107 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 109 A superconductive apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or alkaline earth element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at said temperature to exhibit said superconductivity and a current source for passing an electrical superconducting current through said composition while exhibiting said superconductivity.

CLAIM 110 The combination of claim 15, where said additional element is rare earth or alkaline earth element.

CLAIM 111 A device comprising a superconducting transition metal oxide having a superconductive onset temperature greater than or equal to 26°K, said superconducting transition metal oxide being at a temperature less than said superconducting onset temperature and having a superconducting current flowing therein.

CLAIM 112 A device comprising a superconducting copper oxide having a superconductive onset temperature greater than or equal to 26°K, said superconducting copper oxide being at a temperature less than said superconducting onset temperature and having a superconducting current flowing therein.

CLAIM 113 (ALLOWED) A device comprising a superconducting oxide composition having a superconductive onset temperature greater than or equal to 26°K, said superconducting copper oxide being at a temperature less than said superconducting onset temperature and having a superconducting current flowing therein, said composition comprising at least one each of rare earth, an alkaline earth, and copper.

CLAIM 114 (ALLOWED) A device comprising a superconducting oxide composition having a superconductive onset temperature greater than or equal to 26°K, said superconducting copper oxide being at a temperature less than said superconducting onset temperature and having a superconducting current flowing therein, said composition comprising at least one each of a group IIIB element, an alkaline earth, and copper.

CLAIM 115 A device comprising a transition metal oxide having a T_c greater than or equal to 26°K carrying a superconducting current said transition metal oxide is maintained at a temperature less than said T_c.

CLAIM 116 An apparatus comprising a transition metal oxide having a T_c greater than or equal to 26°K carrying a superconducting current said transition metal oxide is maintained at a temperature less than said T_c.

CLAIM 117 A structure comprising a transition metal oxide having a T_c greater than or equal to 26°K carrying a superconducting current.

CLAIM 118 An apparatus comprising a transition metal oxide having a T_c greater than or equal to 26°K carrying a superconducting current.

CLAIM 119 A device comprising a copper oxide having a T_c greater than or equal to 26°K carrying a superconducting current said copper oxide is maintained at a temperature less than said T_c.

CLAIM 120 An apparatus comprising a copper oxide having a T_c greater than or equal to 26°K carrying a superconducting current said copper oxide is maintained at a temperature less than said T_c.

CLAIM 121 A device comprising a copper oxide having a T_c greater than or equal to 26°K carrying a superconducting current.

CLAIM 122 An apparatus comprising a copper oxide having a T_c greater than or equal to 26°K carrying a superconducting current.

CLAIM 123 (ALLOWED) A superconductive apparatus comprising:

a composition of the formula $Ba_xLa_{x-5}Cu_5O_Y$ wherein x is from about 0.75 to about 1 and
y is the oxygen deficiency resulting from annealing said composition at temperatures from about 540°C to about 950°C and for times of about 15 minutes to about 12 hours, said composition having a metal oxide phase which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said composition at a temperature less than
said critical temperature to induce said superconducting state in said metal oxide phase; and

a current source for passing an electrical current through said composition while said metal oxide phase is in said superconducting state.

CLAIM 124 (ALLOWED) A device comprising a composition of matter having a T_c greater than or equal to 26°K carrying a superconducting current, said composition comprising at least one each of a IIIB element, an alkaline earth, and copper oxide said device is maintained at a temperature less than said T_c.

CLAIM 125 (ALLOWED) An apparatus comprising a composition of matter having a T_c greater than or equal to 26°K carrying a superconducting current,

said composition comprising at least one each of a rare earth, an alkaline earth, and copper oxide.

CLAIM 126 A device comprising a composition of matter having a T_c greater than or equal to 26°K carrying a superconducting current, said composition comprising at least one each of a rare earth, and copper oxide.

CLAIM 127 A device comprising a composition of matter having a T_c greater than or equal to 26°K carrying a superconducting current, said composition comprising at least one each of a IIIB element, and copper oxide.

CLAIM 128 A transition metal oxide device comprising a T_c greater than or equal to 26°K and carrying a superconducting current.

CLAIM 129 A copper oxide device comprising a T_C greater than or equal to 26°K and carrying a superconducting current.

CLAIM 130 A superconductive apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or Group III B element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at said temperature to exhibit said superconductivity and a current source for passing an electrical superconducting current through said composition which exhibiting said superconductivity.

CLAIM 131 The combination of claim 15, where said additional element is a rare earth or Group III B element.

CLAIM 132 The combination of claim 12, where said composition includes a substantially perovskite superconducting phase.

CLAIM 133 The superconducting apparatus of claim 27, where said substituted Cu-oxide includes a rare earth or Group III B element.

CLAIM 134 The combination of claim 71, where said mixed copper oxide further includes a rare earth or Group III B element.

CLAIM 135 (ALLOWED) A combination, comprising:

a mixed copper oxide composition including an alkaline earth element (AE) and a rare earth or Group III B element (RE), said composition having a substantially layered crystalline structure and multi-valent oxidation states, said composition exhibiting a substantially zero resistance to the flow of electrical current therethrough when in a superconducting state at a temperature greater than or equal to 26°K, said mixed copper oxide having a superconducting onset temperature greater than or equal to 26°K and,

a current source for passing an electrical superconducting current through said composition when said composition exhibits substantially zero resistance at a temperature greater than or equal to 26°K and less than said onset temperature.

CLAIM 136 (ALLOWED) The combination of claim 77, where said crystalline structure is substantially perovskite.

CLAIM 137 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or Group III B element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichimetric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and less than said superconducting onset temperature, and

a current source for passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 138 (ALLOWED) The apparatus of claim 93, where said copper oxide material exhibits a substantially layered crystalline structure.

CLAIM 139 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source for causing an electric current to flow in the superconductor element.

CLAIM 140 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including at least one rare-earth or Group III B element and at least one alkaline-earth element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{r=o}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{r=o}$ of the superconductive composition; and

(c) a current source for causing an electric current to flow in the superconductor element.

CLAIM 141 An apparatus comprising a transition metal oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K,

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase, and

a current source passing an electrical supercurrent through said transition metal oxide while it is in said superconducting state.

CLAIM 142 The apparatus of claim 141, where said transition metal oxide is comprised of a transition metal capable of exhibiting multivalent states.

CLAIM 143 The apparatus of claim 141, where said transition metal oxide is comprised of a Cu oxide.

CLAIM 144 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or rare earth-like element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 145 (ALLOWED) The apparatus of claim 144, where said transition metal is copper.

CLAIM 146 An apparatus:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a current source passing an electrical current through said composition while said composition is in said superconductive state.

CLAIM 147 The apparatus of claim 146, where said composition is comprised of a metal oxide.

CLAIM 148 The apparatus of claim 146, where said composition is comprised of a transition metal oxide.

CLAIM 149 A superconductive apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) causing an electric current to flow in the superconductor element.

CLAIM 150 (ALLOWED) The superconductive apparatus according to claim 149 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or rare-earth-like element and at least one alkaline-earth element.

CLAIM 151 (ALLOWED) The superconductive apparatus according to claim 150 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 152 (ALLOWED) The superconductive apparatus according to claim 150 in which the alkaline-earth element is barium.

CLAIM 153 The superconductive apparatus according to claim 149 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 154 The superconductive apparatus according to claim 153 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 155 The superconductive apparatus according to claim 154 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 156 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition having a superconductive/resistive-transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 157 (ALLOWED) The superconductive apparatus according to claim 156 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 158 (ALLOWED) The superconductive apparatus according to claim 156 in which the alkaline-earth element is barium.

CLAIM 159 (ALLOWED) The superconductive apparatus according to claim 156 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 160 (ALLOWED) The superconductive apparatus according to claim 159 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 161 (ALLOWED) The superconductive apparatus according to claim 160 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 162 An apparatus comprising copper oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element.

CLAIM 163 An apparatus comprising:

a composition comprising copper, oxygen and any element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, where said composition is a mixed copper oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 164 An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and an element selected from the group consisting of Group II A element, a rare earth element and a Group III B element.

CLAIM 165 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 166 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound

including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=o}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 167 (ALLOWED) An apparatus comprising:

a copper oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 168 (ALLOWED) An apparatus comprising:

a composition including copper, oxygen and an element selected from the group consisting of at least one Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed copper oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 169 (ALLOWED) An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and at least one element selected from the group consisting of Group II A and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 170 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 171 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity

intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 172 (ALLOWED) An apparatus comprising:

a transition metal oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said transitional metal oxide includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 173 (ALLOWED) An apparatus comprising:

a composition including a transition metal, oxygen and an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element,

where said composition is a mixed transitional metal oxide formed from said transition metal and said oxygen, said mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 174 (ALLOWED) An apparatus:

forming a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a transitional metal oxide and at least one element selected from the group consisting of Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 175 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 176 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound having a layer-type perovskite-like crystal structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 177 (ALLOWED) An apparatus comprising:

a copper oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 178 (ALLOWED) An apparatus comprising:

a composition including copper, oxygen, a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed copper oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 179 (ALLOWED) A structure comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide, a Group II A element, at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 180 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element, and at least one

element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 181 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive-resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 182 An apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or alkaline earth element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a temperature controller maintaining said composition at said temperature to exhibit said superconductivity and a current source passing an electrical superconducting current through said composition with said phrase exhibiting said superconductivity.

CLAIM 183 An apparatus comprising a superconducting transition metal oxide having a superconductive onset temperature greater than or equal to 26°K, a temperature controller maintaining said superconducting transition metal oxide at a temperature less than said superconducting onset temperature and a current source flowing a superconducting current therein.

CLAIM 184 An apparatus comprising a superconducting copper oxide having a superconductive onset temperature greater than or equal to 26°K, a temperature controller maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a current source flowing a superconducting current in said superconducting oxide.

CLAIM 185 (ALLOWED) An apparatus comprising a superconducting oxide composition having a superconductive onset temperature greater than or equal to 26°K, a temperature controller maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a current source flowing a superconducting current therein, said composition comprising at least one each of rare earth, an alkaline earth, and copper.

CLAIM 186 (ALLOWED) An apparatus comprising a superconducting oxide composition having a superconductive onset temperature greater than or equal

to 26°K, a temperature controller maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a current source flowing a superconducting electrical current therein, said composition comprising at least one each of a Group III B element, an alkaline earth, and copper.

CLAIM 187 An apparatus comprising a superconducting electrical current in a transition metal oxide having a T_c greater than or equal to 26°K and maintaining said transition metal oxide at a temperature less than said T_c.

CLAIM 188 An apparatus comprising a current source flowing a superconducting current in a copper oxide having a T_c greater than or equal to 26°K and a temperature controller maintaining said copper oxide at a temperature less than said T_c.

CLAIM 189 (ALLOWED) An apparatus comprising:

a composition of the formula $BaLa_{5-x}Cu_5O_{5(3-y)}$, wherein x is from about 0.75 to about 1 and y is the oxygen deficiency resulting from annealing said composition at temperatures from about 540°C to about 950°C and for times of about 15 minutes to about 12 hours, said composition having a metal oxide phase which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said composition at a temperature less than said critical temperature to induce said superconducting state in said metal oxide phase; and

a current source passing an electrical current through said composition while said metal oxide phase is in said superconducting state.

CLAIM 190 (ALLOWED) An apparatus comprising a current source flowing a superconducting electrical current in a composition of matter having a T_c greater than or equal to 26°K, said composition comprising at least one each of a Group III B element, an alkaline earth, and copper oxide and a temperature controller maintaining said composition of matter at a temperature less than T_c.

CLAIM 191 (ALLOWED) An apparatus comprising a current source flowing a superconducting electrical current in a composition of matter having a T_c greater than or equal to 26°K, said composition comprising at least one each of a rare earth, alkaline earth, and copper oxide and a temperature controller maintaining said composition of matter at a temperature less than said T_c.

CLAIM 192 An apparatus comprising a current source flowing a superconducting electrical current in a composition of matter having a T_c greater than or equal to 26°K, said composition comprising at least one each of a rare earth, and copper oxide and a temperature controller maintaining said composition of matter at a temperature less than said T_c.

CLAIM 193 An apparatus comprising a current source flowing a superconducting electrical current in a composition of matter having a T_c greater than or equal to 26°K carrying, said composition comprising at least one each of a Group III B element, and copper oxide and a temperature controller maintaining said composition of matter at a temperature less than said T_c.

CLAIM 194 An apparatus comprising a current source flowing a superconducting electrical current in a transition metal oxide comprising a T_c greater than or equal to 26°K and a temperature controller maintaining said transition metal oxide at a temperature less than said T_c.

CLAIM 195 An apparatus comprising a current source flowing a superconducting electrical current in a copper oxide composition of matter comprising a T_c greater

than or equal to 26°K and a temperature controller maintaining said copper oxide composition of matter at a temperature less than said T_c.

CLAIM 196 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a Group III B element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 197 (ALLOWED) The apparatus of claim 196, where said transition metal is copper.

CLAIM 198 A superconductive apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 199 The superconductive apparatus according to claim 198 in which the copper-oxide compound of the superconductive composition includes at least one element selected from the group consisting of a rare-earth element, a Group III B element and an alkaline-earth element.

CLAIM 200 The superconductive apparatus according to claim 199 in which the rare-earth is lanthanum.

CLAIM 201 The superconductive apparatus according to claim 199 in which the alkaline-earth element is barium.

CLAIM 202 The superconductive apparatus according to claim 198 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 203 The superconductive apparatus according to claim 202 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 204 The superconductive apparatus according to claim 203 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 205 A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a rare-earth element, a Group III B element and an alkaline-earth element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 206 The superconductive apparatus according to claim 205 in which said at least one element is lanthanum.

CLAIM 207 The superconductive apparatus according to claim 205 in which the alkaline-earth element is barium.

CLAIM 208 The superconductive apparatus according to claim 205 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 209 The superconductive apparatus according to claim 208 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 210 The superconductive apparatus according to claim 209 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 211 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 212 A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=o}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 213 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 214 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 215 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 216 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound having a substantially layered perovskite crystal structure, the transition metal-oxide compound including a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 217 An apparatus according to claim 182 wherein said composition comprises a substantially layered perovskite crystal structure.

CLAIM 218 An apparatus according to claim 183 wherein said superconducting transition metal oxide comprises a substantially layered perovskite crystal structure.

CLAIM 219 An apparatus according to claim 184 wherein said superconducting copper oxide comprises a substantially layered perovskite crystal structure.

CLAIM 220 (ALLOWED) An apparatus according to claim 185 wherein said superconducting oxide composition comprises a substantially layered perovskite crystal structure.

CLAIM 221 (ALLOWED) An apparatus according to claim 186 wherein said superconducting oxide composition comprises a substantially layered perovskite crystal structure.

CLAIM 222 An apparatus according to claim 187 wherein said transition metal oxide comprises a substantially layered perovskite crystal structure.

CLAIM 223 An apparatus according to claim 188 wherein said copper oxide comprises a substantially layered perovskite crystal structure.

CLAIM 224 (ALLOWED) An apparatus according to claim 189 wherein said composition comprises a substantially layered perovskite crystal structure.

CLAIM 225 (ALLOWED) An apparatus according to claim 190 wherein said composition of matter comprises a substantially layered perovskite crystal structure.

CLAIM 226 (ALLOWED) An apparatus according to claim 191 wherein said composition of matter comprises substantially layered perovskite crystal structure.

CLAIM 227 An apparatus according to claim 192 wherein said composition of matter comprises a substantially layered perovskite crystal structure.

CLAIM 228 An apparatus according to claim 193 wherein said composition of matter comprises substantially layered perovskite crystal structure.

CLAIM 229 An apparatus according to claim 194 wherein said transition metal oxide comprises substantially layered perovskite crystal structure.

CLAIM 230 An apparatus according to claim 195 wherein said copper oxide composition comprises substantially layered perovskite crystal structure.

CLAIM 231 (ALLOWED) An apparatus comprising a composition of matter having a T_c greater than or equal to $26^{o}K$ carrying a superconducting current, said composition comprising at least one each of a rare earth, an alkaline earth, and copper oxide.

CLAIM 232 An apparatus comprising:

a transition metal oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K,

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase, and

a source of an electrical supercurrent through said transition metal oxide while it is in said superconducting state.

CLAIM 233 An apparatus according to claim 232, where said transition metal oxide is comprised of a transition metal capable of exhibiting multivalent states.

CLAIM 234 An apparatus according to claim 232, where said transition metal oxide is comprised of a Cu oxide.

CLAIM 235 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or rare earth-like element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 236 (ALLOWED) An apparatus according to claim 235, where said transition metal is copper.

CLAIM 237 An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a source of an electrical current through said composition while said composition is in said superconductive state.

CLAIM 238 An apparatus according to claim 237, where said composition is comprised of a metal oxide.

CLAIM 239 An apparatus according to claim 238, where said composition is comprised of a transition metal oxide.

CLAIM 240 An apparatus capable of carrying electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 241 (ALLOWED) An apparatus according to claim 240 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or rare-earth-like element and at least one alkaline-earth element.

CLAIM 242 (ALLOWED) An apparatus according to claim 241 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 243 (ALLOWED) An apparatus according to claim 241 in which the alkaline-earth element is barium.

CLAIM 244 An apparatus according to claim 240 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 245 An apparatus according to claim 244 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 246 An apparatus according to claim 245 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 247 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 248 (ALLOWED) An apparatus according to claim 247 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 249 (ALLOWED) An apparatus according to claim 247 in which the alkaline-earth element is barium.

CLAIM 250 (ALLOWED) An apparatus according to claim 247 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 251 (ALLOWED) An apparatus according to claim 250 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 252 (ALLOWED) An apparatus according to claim 251 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 253 An apparatus comprising:

a copper oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a source of an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element.

CLAIM 254 An apparatus comprising:

a composition including copper, oxygen and an element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, where said composition is a mixed copper oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 255 An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a source of an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and an element selected from the group consisting of Group II A element, a rare earth element and a Group III B element.

CLAIM 256 An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 257 An apparatus capable of carrying an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 258 (ALLOWED) An apparatus comprising:

a copper oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a source of an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 259 (ALLOWED) An apparatus comprising:

a composition including copper, oxygen and an element selected from the group consisting of at least one Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed copper oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 260 (ALLOWED) An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a source of an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and at least one element selected from the group consisting of Group II A and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 261 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 262 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 263 (ALLOWED) An apparatus comprising:

a transition metal oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a source of an electrical supercurrent through said transition metal oxide while it is in said superconducting state;

said transitional metal oxide includes at least one element selected from the group consisting of a Group II A element and at lest one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIMS 264 (ALLOWED) An apparatus comprising:

a composition including a transition metal, oxygen and an element selected from the group consisting of at least one Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed transitional metal oxide formed from said transition metal and said oxygen, said mixed transition metal oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 265 (ALLOWED) An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a source of an electrical current through said composition while said composition is in said superconductive state; and

said composition including a transitional metal oxide and at least one element selected from the group consisting of Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 266 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 267 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a layer-type perovskite-like crystal structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 268 An apparatus comprising:

a copper oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a source for an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one element selected from group consisting of a Group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element.

CLAIM 269 (ALLOWED) An apparatus comprising:

a composition including copper, oxygen and an element selected from the group consisting of at least one Group II A element and at least one element selected from the group consisting of a rare earth element at least one element selected from the group consisting of a Group III B element, where said composition is a mixed copper oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 270 (ALLOWED) An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a source of an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and at least one element selected from the group consisting of Group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element.

CLAIM 271 (ALLOWED) An apparatus for causing an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 272 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element, the composition comprising a superconductive-resistive transition temperature defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 273 An apparatus comprising a composition comprising a transition temperature greater than or equal to 26°K, the composition including a rare earth or alkaline earth element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at said temperature to exhibit said superconductivity and a source of an electrical superconducting current through said composition with said phrase exhibiting said superconductivity.

CLAIM 274 An apparatus comprising providing a superconducting transition metal oxide comprising a superconductive onset temperature greater than or equal to 26°K, a temperature controller for maintaining said superconducting

transition metal oxide at a temperature less than said superconducting onset temperature and a source of a superconducting current therein.

CLAIM 275 An apparatus comprising a superconducting copper oxide comprising a superconductive onset temperature greater than or equal to 26°K, a temperature controller for maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a source of a superconducting current in said superconducting oxide.

CLAIM 276 (ALLOWED) An apparatus comprising a superconducting oxide composition comprising a superconductive onset temperature greater than or equal to 26°K , a temperature controller for maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a source of a superconducting current therein, said composition comprising at least one each of rare earth, an alkaline earth, and copper.

CLAIM 277 (ALLOWED) An apparatus comprising a superconducting oxide composition comprising a superconductive onset temperature greater than or equal to 26°K, a temperature controller for maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a source of a superconducting electrical current therein, said composition comprising at least one each of a Group III B element, an alkaline earth, and copper.

CLAIM 278 An apparatus comprising a source of a superconducting electrical current in a transition metal oxide comprising a T_c greater than or equal to 26°K and a temperature controller for maintaining said transition metal oxide at a temperature less than said T_c.

CLAIM 279 An apparatus comprising a source of a superconducting current in a copper oxide comprising a T_c greater than or equal to 26°K and a temperature controller for maintaining said copper oxide at a temperature less than said T_c.

CLAIM 280 (ALLOWED) An apparatus comprising:

a composition of the formula Ba_xLa_{x-5}, Cu_5O_Y, wherein x is from about 0.75 to about 1 and y is the oxygen deficiency resulting from annealing said composition at temperatures from about 540°C to about 950°C and for times of about 15 minutes to about 12 hours, said composition comprising a metal oxide phase which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said composition at a temperature less than said critical temperature to induce said superconducting state in said metal oxide phase; and

a source of an electrical current through said composition while said metal oxide phase is in said superconducting state.

CLAIM 281 (ALLOWED) An apparatus comprising a source of a superconducting electrical current in a composition of matter comprising a T_c greater than or equal to 26°K, said composition comprising at least one each of a III B element, an alkaline earth, and copper oxide and a temperature controller for maintaining said composition of matter at a temperature less than T_c.

CLAIM 282 (ALLOWED) An apparatus comprising a source of a superconducting electrical current in a composition of matter comprising a T_c greater than or equal to 26°K, said composition comprising at least one each of a rare earth, alkaline earth, and copper oxide and a temperature controller for maintaining said composition of matter at a temperature less than said T_c.

CLAIM 283 An apparatus comprising a source of a superconducting electrical current in a composition of matter comprising a T_c greater than or equal to 26°K, said composition comprising at least one each of a rare earth, and copper oxide and a temperature controller for maintaining said composition of matter at a temperature less than said T_c.

CLAIM 284 An apparatus comprising a source of a superconducting electrical current in a composition of matter comprising a T_c greater than or equal to 26°K carrying, said composition comprising at least one each of a III B element, and copper oxide and a temperature controller for maintaining said composition of matter at a temperature less than said T_c.

CLAIM 285 An apparatus comprising a source of a superconducting electrical current in a transition metal oxide comprising a T_c greater than or equal to 26°K and a temperature controller for maintaining said transition metal oxide at a temperature less than said T_c.

CLAIM 286 An apparatus comprising a source of a superconducting electrical current in a copper oxide composition of matter comprising a T_c greater than or equal to 26°K and a temperature controller for maintaining said copper oxide composition of matter at a temperature less than said T_c.

CLAIM 287 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a group IIIB element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 288 (ALLOWED) An apparatus according to claim 287, where said transition metal is copper.

CLAIM 289 An apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K;

b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 290 An apparatus according to claim 289 in which the copper-oxide compound of the superconductive composition includes at least one element selected from the group consisting of a rare-earth element and a Group III B element and at least one alkaline-earth element.

CLAIM 291 An apparatus according to claim 290 in which the rare-earth or element is lanthanum.

CLAIM 292 An apparatus according to claim 290 in which the alkaline-earth element is barium.

CLAIM 293 An apparatus according to claim 289 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 294 An apparatus according to claim 293 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 295 An apparatus according to claim 294 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 296 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a rare-earth element and a Group III B element and at least one alkaline-earth element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26^oK;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 297 (ALLOWED) An apparatus according to claim 296 in which said at least one element is lanthanum.

CLAIM 298 (ALLOWED) An apparatus according to claim 296 in which the alkaline-earth element is barium.

CLAIM 299 (ALLOWED) An apparatus according to claim 296 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 300 (ALLOWED) An apparatus according to claim 299 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 301 (ALLOWED) An apparatus according to claim 300 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 302 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal

to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 303 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and
(c) a source of an electric current to flow in the superconductor element.

CLAIM 304 (ALLOWED) An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to
26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 305 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset

temperature Tc and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 306 (ALLOWED) An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a substantially layered perovskite crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 307 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a substantially layered perovskite crystal structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 308 An apparatus according to claim 273 wherein said composition comprises a substantially layered perovskite crystal structure.

CLAIM 309 An apparatus according to claim 274 wherein said superconducting transition metal oxide comprises a substantially layered perovskite crystal structure.

CLAIM 310 An apparatus according to claim 275 wherein said superconducting copper oxide comprises a substantially layered perovskite crystal structure.

CLAIM 311 (ALLOWED) An apparatus according to claim 276 wherein said superconducting oxide composition comprises a substantially layered perovskite crystal structure.

CLAIM 312 (ALLOWED) An apparatus according to claim 277 wherein said superconducting oxide composition comprises a substantially layered perovskite crystal structure.

CLAIM 313 An apparatus according to claim 278 wherein said transition metal oxide comprises a substantially layered perovskite crystal structure.

CLAIM 314 An apparatus according to claim 279 wherein said copper oxide comprises a substantially layered perovskite crystal structure.

CLAIM 315 (ALLOWED) An apparatus according to claim 280 wherein said composition comprises a substantially layered perovskite crystal structure.

CLAIM 316 (ALLOWED) An apparatus according to claim 281 wherein said composition of matter comprises a substantially layered perovskite crystal structure.

CLAIM 317 (ALLOWED) An apparatus according to claim 282 wherein said composition of matter comprises substantially layered perovskite crystal structure.

CLAIM 318 An apparatus according to claim 283 wherein said composition of matter comprises a substantially layered perovskite crystal structure.

CLAIM 319 An apparatus according to claim 284 wherein said composition of matter comprises substantially layered perovskite crystal structure.

CLAIM 320 An apparatus according to claim 285 wherein said transition metal oxide comprises substantially layered perovskite crystal structure.

CLAIM 321 An apparatus according to claim 286 wherein said copper oxide composition comprises substantially layered perovskite crystal structure.

CLAIM 322 A superconductive combination according to anyone of claims 84 or 85, wherein said mixed transition metal oxide can be made according to known principles of ceramic science.

CLAIM 323 An apparatus according to anyone of claims 86, 87, 144, 146, 147, 163, 164, 168, 169, 173, 174, 178, 182, 189, 196, 197, 214, 224, 235, 236, 237, 239, 254, 255, 259, 260, 264, 265 or 273, wherein said composition can be made according to known principles of ceramic science.

CLAIM 324 A combination according to anyone of claims 91, 92 or 36 to 39, wherein said composition can be made according to known principles of ceramic science.

CLAIM 325 A superconductive apparatus according to anyone of claims 1 to 11, 33 to 35, 66 to 68,109, 130, 361-366 or 370, wherein said composition can be made according to known principles of ceramic science.

CLAIM 326 An apparatus according to anyone of claims 93 to 95 or 138, wherein said mixed copper oxide can be made according to known principles of ceramic science.

CLAIM 327 A combination according to anyone of claims 64 or 135, wherein said mixed copper oxide can be made according to known principles of ceramic science.

CLAIM 328 A superconductive apparatus according to anyone of claims 48 to 52, 96 to 108, 198 to 204, 371, 383 or 384, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 329 A superconductive combination according to anyone of claims 12 to 23, 110, 131, 132 or 367-370, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 330 (ALLOWED) An apparatus according to anyone of claims 185 or 220, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 331 A device according to claim 111, wherein said superconductive transition metal oxide can be made according to known principles of ceramic science.

CLAIM 332 An apparatus according to anyone of claims 183, 217, 218, 274 or 309, wherein said superconductive transition metal oxide can be made according to known principles of ceramic science.

CLAIM 333 A device according to claim 112, wherein said superconductive copper oxide can be made according to known principles of ceramic science.

CLAIM 334 An apparatus according to anyone of claims 275, 276, 310 or 311, wherein said superconductive copper oxide can be made according to known principles of ceramic science.

CLAIM 335 (ALLOWED) A device according to claim 113, wherein said superconductive oxide composition can be made according to known principles of ceramic science.

CLAIM 336 (ALLOWED) An apparatus according to anyone of claims 186, 221, 272, 312 or 413, wherein said superconductive oxide composition can be made according to known principles of ceramic science.

CLAIM 337 A device according to anyone of claims 114 or 117, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 338 An apparatus according to anyone of claims 24 to 26, 60 to 63, 116, 141 to 143, 172, 187, 222, 232 to 234, 263, 278, 285, 287, 288, 313 or 320, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 339 A superconductive apparatus according to anyone of claims 27-32, 132 or 370, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 340 An invention according to claim 118, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 341 A transition metal oxide device according to claim 128, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 342 An apparatus according to anyone of claims 40 to 45, wherein said superconductor can be made according to known principles of ceramic science.

CLAIM 343 A device according to anyone of claims 119 or 121, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 344 An apparatus according to claim 120, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 345 An invention according to claim 122, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 346 (ALLOWED) A superconductive apparatus according to claim 123, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 347 A copper oxide device according to claim 129, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 348 An apparatus according to anyone of claims 162, 167, 177, 188, 223, 253, 258, 268, 269, 270, 279 or 314, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 349 A combination according to claim 57, wherein said superconductive oxide can be made according to known principles of ceramic science.

CLAIM 350 A combination according to anyone of claims 58 or 373, wherein said copper oxide conductor can be made according to known principles of ceramic science.

CLAIM 351 A combination according to claim 59, wherein said ceramic-like material can be made according to known principles of ceramic science.

CLAIM 352 A superconductive combination according to anyone of claims 69 to 71 or 134, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 353 A superconductive apparatus according to anyone of claims 139, 140, 149 to 155, 156 to 161, 170, 171, 175, 176, 180, 181, 205 to 216, 387-393, or 396-401, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 354 An apparatus according to anyone of claims 165, 166, 185, 220, 240 to 246, 247 to 252, 261, 262, 289, 290 to 301, 394, 395, 402-406, 409 or 410, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 355 A combination according to anyone of claims 77 to 81, 186, 379 or 380, wherein said mixed copper oxide composition can be made according to known principles of ceramic science.

CLAIM 356 A device according to anyone of claims 124 to 127, wherein said composition of matter can be made according to known principles of ceramic science.

CLAIM 357 An apparatus according to anyone of claims 190 to 194, 225 to 229, 231, 256, 257, 266, 267, 271, 272, 281 to 284, 317 to 319, 407, or 411 to 413, wherein said composition of matter can be made according to known principles of ceramic science.

CLAIM 358 (ALLOWED) An apparatus according to anyone of claims 186 or 221, wherein said superconductive oxide composition can be made according to known principles of ceramic science.

CLAIM 359 An apparatus according to anyone of claims 195 or 230, wherein said copper oxide composition can be made according to known principles of ceramic science.

CLAIM 360 An apparatus according to anyone of claims 286 or 321, wherein said copper oxide composition can be made according to known principles of ceramic science.

CLAIM 361 A superconducting apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or an element comprising a rare earth characteristic, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at said temperature to exhibit said superconductivity and a current source for passing an electrical superconducting current through said composition while exhibiting said superconductivity.

CLAIM 362 The superconducting apparatus of claim 361, further including an alkaline earth element substituted for at least one atom of said rare earth or element comprising a rare earth characteristic in said composition.

CLAIM 363 The superconducting apparatus of claim 362, where said rare earth or element comprising a rare earth characteristic is selected from the group consisting of La, Nd, and Ce.

CLAIM 364 The superconducting apparatus of claim 361, where said phase is crystalline with a structure comprising a perovskite characteristic.

CLAIM 365 The superconducting apparatus of claim 362, where said phase is crystalline with a structure comprising a perovskite characteristic.

CLAIM 366 The superconducting apparatus of claim 361, where said phase exhibits a crystalline structure comprising a layered characteristic.

CLAIM 367 The combination of claim 15, where said additional element is a rare earth or an element comprising a rare earth characteristic.

CLAIM 368 The combination of claim 12, where said composition includes a superconducting phase comprising a perovskite characteristic.

CLAIM 369 The combination of claim 20, where said substituted transition metal oxide has a structure comprising a layered characteristic.

CLAIM 370 The superconducting apparatus of claim 31, where said crystalline structure comprises a layered characteristic, enhancing the number of Jahn-Teller polarons in said composite.

CLAIM 371 The superconductive apparatus of claim 48, where said substitutions include a rare earth or an element comprising a rare earth characteristic.

CLAIM 372 A superconductive apparatus comprised of a copper oxide comprising a crystalline structure comprising a layered characteristic and at least one additional element substituted in said crystalline structure, said structure being oxygen deficient and exhibiting a superconducting onset temperature greater than or equal to 26°K.

CLAIM 373 A combination, comprised of:

a copper oxide superconductor having a superconductor onset temperature greater than about 26°K including an element which results in a mixed valent state in said oxide, said oxide being crystalline and comprising a structure comprising a layered characteristic,

a current source for passing a superconducting current through said copper oxide while it is maintained at a temperature greater than or equal to 26°K and less than said superconducting onset temperature, and

a temperature controller for cooling said copper oxide to a superconductive state at a temperature greater than or equal to 26°K and less than said superconducting onset temperature.

CLAIM 374 A combination, comprised of:

a material comprising a ceramic characteristic comprising an onset of superconductivity at an onset temperature greater than or equal to 26°K,

a current source for passing a superconducting electrical current through said material comprising a ceramic characteristic while said material is maintained at a temperature greater than or equal to 26°K and less than said onset temperature, and

a temperature controller for cooling said superconducting material having a ceramic characteristic to a superconductive state at a temperature greater than or equal to 26°K and less than said onset temperature, said material being superconductive at temperatures below said onset temperature and a ceramic at temperatures above said onset temperature.

CLAIM 375 (ALLOWED) An apparatus comprising a composition exhibiting superconductivity at temperatures greater than or equal to 26°K, said composition being a material comprising a ceramic characteristic in the RE-AE-TM-O system, where RE is a rare earth or near rare earth element, AE is an alkaline earth element, TM is a multivalent transition metal element having at least two valence states in said composition, and O is oxygen, the ratio of the amounts of said transition metal in said two valence states being determined by

the ratio RE : AE, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature greater than or equal to 26°K.

CLAIM 376 The combination of claim 71, where said mixed copper oxide further includes a rare earth or an element comprising a rare earth characteristic.

CLAIM 377 (WITHDRAWN) An apparatus comprising a superconductor having a superconducting onset temperature greater than or equal to 26°K, said superconductor being made by a method including the steps of:

preparing powders of oxygen-containing compounds of a rare earth or rare earth-like element, an alkaline earth element, and copper,

mixing said compounds and firing said mixture to create a mixed copper oxide composition including said alkaline earth element and said rare earth or rare earth-like element, and

annealing said mixed copper oxide composition at an elevated temperature less than about 950°C in an atmosphere including oxygen to produce a superconducting composition having a mixed copper oxide phase exhibiting a superconducting onset temperature greater than or equal to 26°K, said superconducting composition comprising a crystalline structure comprising a layered characteristic after said annealing step.

CLAIM 378 (WITHDRAWN) An apparatus comprising a superconductor having a superconducting onset temperature greater than or equal to 26°K, said superconductor being comprised of a rare earth or an element (RE) comprising a rare earth characteristic, an alkaline earth element (AE), copper (CU), and oxygen (O) and having the general formula RE-AE-CU-O, said superconductor

being made by a method comprising the steps of combining said rare earth or element comprising a rare earth characteristic, said alkaline earth element and said copper in the presence of oxygen to produce a mixed copper oxide including said rare earth or rare earth-like element and said alkaline earth element therein, and

heating said mixed copper oxide to produce a superconductor having a crystalline structure comprising a layered characteristic and exhibiting a superconducting onset temperature greater than or equal to 26°K the critical transition temperature of said superconductor being dependent on the amount of said alkaline earth element therein.

CLAIM 379 A combination, comprising:

a mixed copper oxide composition including an alkaline earth element (AE) and a rare earth or element (RE) comprising a rare earth characteristic, said composition comprising a crystalline structure comprising a layered characteristic and multi-valent oxidation states, said composition exhibiting *a* substantially zero resistance to the flow of electrical current therethrough when cooled to a superconducting state at a temperature greater than or equal to 26°K, said mixed copper oxide having a superconducting onset temperature greater than or equal to 26°K, and

a current source for passing an electrical superconducting current through said composition when said composition exhibits substantially zero resistance at a temperature greater than or equal to 26°K and less than said onset temperature.

CLAIM 380 The combination of claim 379, wherein said crystalline structure comprises a perovskite characteristic.

CLAIM 381 (ALLOWED) An apparatus comprising a superconductor having a superconducting onset temperature greater than or equal to 26°K, said superconductor being comprised of a rare earth or an element (RE) comprising a rare earth characteristic, an alkaline earth element (AE), a transition metal element (TM), and Oxygen (O) and having the general formula RE-AE-TM-O, said superconductor being made by a method comprising the steps of combining said rare earth or element comprising a rare earth characteristic, said alkaline earth element and said transition metal element in the presence of oxygen to produce a mixed transition metal oxide including said rare earth or element comprising a rare earth characteristic and said alkaline earth element therein, and

heating said mixed transition metal oxide to produce superconductor having a crystalline structure comprising a layered characteristic and exhibiting a superconducting onset temperature greater than or equal to 26°K, said superconductor having a non-stoichiometric amount of oxygen therein.

CLAIM 382 The apparatus of claim 93, where said copper oxide material exhibits a crystalline structure comprising a layered characteristic.

CLAIM 383 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition comprising a copper-oxide compound having a crystal structure comprising a perovskite characteristic and a layered characteristic, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source for causing an electric current to flow in the superconductor element.

CLAIM 384 (ALLOWED) The superconductive apparatus according to claim 383 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or element comprising a rare earth characteristic and at least one alkaline-earth element.

CLAIM 385 (ALLOWED) The superconductive apparatus according to claim 384 in which the rare-earth or element comprising a rare earth characteristic is lanthanum.

CLAIM 386 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one rare-earth or element comprising a rare earth characteristic and at least one alkaline-earth element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$ of the superconductive composition; and

(c) a current source for causing an electric current to flow in the superconductor element.

CLAIM 387 (ALLOWED) The superconductive apparatus according to claim 386 in which the rare-earth or an element comprising a rare earth characteristic is lanthanum.

CLAIM 388 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or an element comprising a rare earth characteristic, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 389 A superconductive apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound

comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) causing an electric current to flow in the superconductor element.

CLAIM 390 (ALLOWED) The superconductive apparatus according to claim 389 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or an element comprising a rare earth characteristic and at least one alkaline-earth element.

CLAIM 391 (ALLOWED) The superconductive apparatus according to claim 390 in which the rare-earth or an element comprising a rare earth characteristic is lanthanum.

CLAIM 392 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition having a superconductive/resistive-transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an

effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 393 (ALLOWED) The superconductive apparatus according to claim 392 in which the rare-earth or an element comprising a rare earth characteristic is lanthanum.

CLAIM 394 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 395 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=o}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 396 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductive transition

temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 397 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 398 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 399 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at

least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 400 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 401 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive-resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 402 An apparatus capable of carrying electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound

comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 403 (ALLOWED) An apparatus according to claim 402 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or an element comprising a rare earth characteristic and at least one alkaline-earth element.

CLAIM 404 (ALLOWED) An apparatus according to claim 403 in which the rare-earth or element comprising a rare earth characteristic is lanthanum.

CLAIM 405 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound comprising at least one rare-earth or element comprising a rare earth characteristic and at least one alkaline-earth element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 406 (ALLOWED) An apparatus according to claim 405 in which the rare-earth or element comprising a rare earth characteristic is lanthanum.

CLAIM 407 An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 408 An apparatus capable of carrying an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 409 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 410 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 411 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 412 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 413 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element, the composition comprising a superconductive-resistive transition temperature defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 414 A superconducting apparatus according to anyone of claims 361-365 or 366, wherein said composition can be made according to known principles of ceramic science.

CLAIM 415 A superconducting combination according to anyone of claims 367, 368 or 369, wherein said composition can be made according to known principles of ceramic science.

CLAIM 416 A superconducting apparatus according to anyone of claims 370 or 371, wherein said composition can be made according to known principles of ceramic science.

CLAIM 417 A superconducting apparatus according to claim 372, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 418 A combination according to claim 373, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 419 A combination according to claim 374, wherein said material can be made by known principles of ceramic science.

CLAIM 420 A apparatus according to claim 375, wherein said composition can be made by known principles of ceramic science.

CLAIM 421 A combination according to claim 376, wherein said mixed copper oxide can be made by known principles of ceramic science.

CLAIM 422 A combination according to anyone of claims 379 or 380, wherein said mixed copper oxide can be made by known principles of ceramic science.

CLAIM 423 A apparatus according to claim 382, wherein said copper oxide material can be made by known principles of ceramic science.

CLAIM 424 A superconductive apparatus according to anyone of claims 383, 384, 385, 386, 387 and 389, wherein said composition can be made by known principles of ceramic science.

CLAIM 425 A apparatus according to claim 388, wherein said composition can be made according to known principles of ceramic science.

CLAIM 426 A superconductive apparatus according to anyone of claims 389 to 400 or 401, wherein said superconductive composition can be made by known principles of ceramic science.

CLAIM 427 A apparatus according to anyone of claims 402 to 412 or 413, wherein said superconductive composition can be made by known principles of ceramic science.

CLAIM 428 An apparatus capable of carrying electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

a superconductive element comprising a superconductive composition, said superconductive composition comprising O and at least one element selected from the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu; and

said composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K.

CLAIM 429 An apparatus according to claim 428, further including:

a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

a source of an electric current to flow in the superconductor element.

CLAIM 430 An apparatus according to claim 428, wherein said composition comprises a substantially layered structure.

CLAIM 431 An apparatus according to claim 429, wherein said composition comprises a substantially layered structure.

CLAIM 432 An apparatus according to anyone of claims 428 to 430 or 431, wherein said composition comprises a substantially perovskite crystal structure.

CLAIM 433 An apparatus according to any one of claims 428 to 430 or 431, wherein said composition comprises a perovskite-like structure.

CLAIM 434 An apparatus according to any one of claims 428 to 430 or 431, wherein said composition comprises a perovskite characteristic.

CLAIM 435 An apparatus according to any one of claims 428 to 430 or 431, wherein said composition comprises a perovskite related structure.

CLAIM 436 An apparatus according to anyone of claims 428 to 431 or 432, wherein said composition can be made according to known principals of ceramic science.

CLAIM 437 An apparatus according to claim 88 wherein said composition is an oxide.

CLAIM 438 An apparatus comprising: a means for conducting a superconducting current at a temperature greater than or equal to 26°K and a current source for providing an electric current to flow in said means for conducting a superconducting current.

CLAIM 439 An apparatus according to claim 438, wherein said means for conducting a superconductive current comprises a T_c greater than or equal to 26°K.

CLAIM 440 An apparatus according to claim 438, further including a temperature controller for maintaining said means for conducting a superconducting current at a said temperature.

CLAIM 441 An apparatus according to anyone of claims 438, 439 or 440, wherein said means for conducting a superconducting current comprises oxygen.

CLAIM 442 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises one or more of the groups consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 443 An apparatus according to anyone of claims 438, 439 or 440, wherein said means for conducting a superconducting current comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 444 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a layered structure.

CLAIM 445 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a substantially perovskite structure.

CLAIM 446 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a perovskite-like structure.

CLAIM 447 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a perovskite related structure.

CLAIM 448 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a structure having a perovskite characteristic.

CLAIM 449 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a transition metal.

CLAIM 450 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a copper oxide.

CLAIM 451 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises oxygen in a nonstoichiomeric amount.

CLAIM 452 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a multivalent transition metal.

CLAIM 453 An apparatus according to anyone of claims 438, 439 or 440, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 454 An apparatus according to claim 441, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 455 An apparatus according to claim 442, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 456 An apparatus according to claim 443, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 457 An apparatus according to claim 444, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 458 An apparatus according to claim 445, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 459 An apparatus according to claim 446, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 460 An apparatus according to claim 447, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 461 An apparatus according to claim 448, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 462 An apparatus according to claim 449, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 463 An apparatus according to claim 450, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 464 An apparatus according to claim 451, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 465 An apparatus according to claim 452, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 466 An apparatus comprising:

a superconductive current carrying element comprising a T_c greater than or equal to 26°K;

said superconductive current carrying element comprises a property selected from one or more of the group consisting of a mixed valent oxide, a transition metal, a mixed valent transition metal, a perovskite structure, a perovskite-like

structure, a perovskite related structure, a layered structure, a stoichiomeric or nonstoichiomeric oxygen contents and a dopant.

CLAIM 467 An apparatus according to claim 466, wherein said superconductive current carrying element is at a temperature greater than or equal to 26°K.

CLAIM 468 An apparatus according to claim 466, further including a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

CLAIM 469 An apparatus according to anyone of claims 466, 467 or 468, wherein said superconductive current carrying element comprises one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 470 An apparatus according to anyone of claims 466, 467 or 468, wherein said superconductive current carrying element comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 471 An apparatus according to claim 469, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 472 An apparatus according to claim 470, wherein said superconductive current carrying element comprises a transition metal

CLAIM 473 An apparatus according to anyone of claims 466, 467, or 468, wherein said superconducting current carrying element can be made according to known principles of ceramic science.

CLAIM 474 An apparatus according to of claim 471, wherein said superconducting current carrying element can be made according to known principles of ceramic science.

CLAIM 475 An apparatus according to of claim 472, wherein said superconducting current carrying element can be made according to known principles of ceramic science.

CLAIM 476 An apparatus comprising:

a superconductive current carrying element comprising a T_c greater than or equal to 26°K
;

said superconductive current carrying element comprises an oxide, a layered perovskite structure or a layered perovskite-like structure and comprises a stoichiomeric or nonstoichiomeric oxygen content.

CLAIM 477 An apparatus according to claim 476, wherein said superconductive current carrying element is at a temperature greater than or equal to 26°K .

CLAIM 478 An apparatus according to claim 476, further including a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

CLAIM 479 An apparatus according to anyone of claims 476, 477 or 478, wherein said superconductive current carrying element comprises one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 480 An apparatus according to anyone of claims 476, 477 or 478, wherein said superconductive current carrying element comprises one or more of

Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 481 An apparatus according to claim 479, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 482 An apparatus according to claim 480, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 483 An apparatus according to claim 476, wherein said superconductive current carrying element comprises copper oxide.

CLAIM 484 An apparatus according to anyone of claims 476, 477 or 478, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 485 An apparatus according to claim 479, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 486 An apparatus according to claim 480, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 487 An apparatus according to claim 481, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 488 An apparatus according to claim 482, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 489 An apparatus according to claim 483, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 490 An apparatus according to claim 484, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 491 An apparatus according to claim 485, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 492 The superconducting apparatus of claim 361, where said phase is crystalline with a structure comprising a perovskite related structure.

CLAIM 493 The superconducting apparatus of claim 362, where said phase is crystalline with a structure comprising a perovskite related structure.

CLAIM 494 The combination of claim 12, where said composition includes a superconducting phase comprising a perovskite related structure.

CLAIM 495 The combination of claim 379, wherein said crystalline structure comprises a perovskite related structure.

CLAIM 496 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition comprising a copper-oxide compound having a crystal structure comprising a perovskite related structure and a layered

characteristic, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source for causing an electric current to flow in the superconductor element.

CLAIM 497 A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one rare-earth or element comprising a rare earth characteristic and at least one alkaline-earth element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$ of the superconductive composition; and

(c) a current source for causing an electric current to flow in the superconductor element.

CLAIM 498 A superconductive apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) causing an electric current to flow in the superconductor element.

CLAIM 499 A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition having a superconductive/resistive-transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 500 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 501 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a

perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=o}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 502 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 503 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 504 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 505 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 506 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 507 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound

comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive-resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 508 An apparatus capable of carrying electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 509 An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 510 An apparatus capable of carrying an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity

intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and
(c) a source of an electric current to flow in the superconductor element.

CLAIM 511 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 512 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 513 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 514 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 515 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element, the composition comprising a superconductive-resistive transition temperature defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 516 An apparatus of claim 146 wherein said means for carrying a superconductive current is comprised of an oxide.

CLAIM 517 An apparatus comprising:

a superconductive current carrying element comprising a T_c greater than or equal to 26°K;

said superconductive current carrying element comprises a metallic, oxygen-deficient, perovskite-like, mixed valent copper compound.

CLAIM 518 An apparatus according to claim 517, wherein said superconductive current carrying element is at a temperature greater than or equal to 26°K.

CLAIM 519 An apparatus according to claim 517, further including a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

CLAIM 520 An apparatus according to anyone of claims 517, 518 or 519, wherein said superconductive current carrying element comprises one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho Er, Tm, Yb and Lu.

CLAIM 521 An apparatus according to anyone of claims 517, 518 or 519, wherein said superconductive current carrying element comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 522 An apparatus comprising:

a superconductive current carrying element comprising a greater than or equal to 26°K;

said superconductive current carrying element comprises a composition that can be made according to known principles of ceramic science.

CLAIM 523 An apparatus according to claim 522, wherein said superconductive current carrying element is at a temperature greater than or equal to 26°K.

CLAIM 524 An apparatus according to claim 523, further including a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

CLAIM 525 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 526 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 527 An apparatus according to claim 525, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 528 An apparatus according to claim 526, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 529 An apparatus according to claim 522, wherein said superconductive current carrying element comprises copper oxide.

CLAIM 530 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element is substantially perovskite.

CLAIM 531 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises a perovskite-like structure.

CLAIM 532 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises a perovskite related structure.

CLAIM 533 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises a nonstoichiometric amount of oxygen.

CLAIM 534 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises a layered structure.

CLAIM 535 An apparatus comprising a superconductor exhibiting a superconducting onset at an onset temperature greater than or equal to 26°K, said superconductor being comprised of at least four elements, none of which is a means for carrying a superconducting current at a temperature greater than or equal to 26°K, a temperature controller for maintaining said superconductor at an operating temperature in excess of said onset temperature to maintain said superconductor in a superconducting state and a current source for passing current through said superconductor while in said superconducting state.

CLAIM 536 An apparatus comprising:

a means for carrying a superconductive current exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a cooler for cooling said composition to a temperature greater than or equal to 26°K at which temperature said means for carrying a superconductive current exhibits said superconductive state, and

a current source for passing an electrical current through said composition while said composition is in said superconductive state.

CLAIM 537 An apparatus comprising:

a metallic, oxygen-deficient, perovskite-like, mixed valent transition metal composition exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a current source passing an electrical current through said composition while said composition is in said superconductive state.

CLAIM 538 The apparatus of claim 537, where said means for carrying a superconductive current is comprised of a metal oxide.

CLAIM 539 The apparatus of claim 537, where said means for carrying a superconductive current is comprised of a transition metal oxide.

CLAIM 540 An apparatus comprising:

a composition comprising oxygen exhibiting a superconductive state at a temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a source of an electrical current through said composition while said composition is in said superconductive state.

CLAIM 541 An apparatus according to claim 540, where said composition is comprised of a metal oxide.

CLAIM 542 An apparatus according to claim 541, where said composition is comprised of a transition metal oxide.

CLAIM 543 A combination, comprising:

an oxygen containing composition exhibiting the onset of a DC substantially zero resistance state at an onset temperature in excess of 30°K, and

a current source for passing an electrical current through said composition while it is in said substantially zero resistance state.

CLAIM 544 An apparatus according to claim 535, wherein said superconductor can be made according to known principles of ceramic science.

CLAIM 545 An apparatus according to claim 536, wherein said means for carrying a superconductive current can be made according to known principles of ceramic science.

CLAIM 546 An apparatus according to any one of claims 537, 538 or 539 wherein said composition can be made according to known principles of ceramic science.

CLAIM 546 An apparatus according to any one of claims 540, 541 or 542 wherein said composition can be made according to known principles of ceramic science.

CLAIM 547 A combination according to claim 543, wherein said composition can be made according to known principles of ceramic science.

CLAIM 548 An apparatus according to anyone of claims 496 to 514 or 515, wherein said superconductive element can be made according to known principles of ceramic science.

CLAIM 549 An apparatus according to claim 516, wherein said means for carrying a superconductive current can be made according to known principles of ceramic science.

CLAIM 550 An apparatus according to anyone of claims 517 to 520 or 521, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

Part VIII
Claims Appendix B

CLAIM 1 A superconducting apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or rare earth-like element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a means for maintaining said composition at said temperature to exhibit said superconductivity and means for passing an electrical superconducting current through said composition while exhibiting said superconductivity.

CLAIM 2 The superconducting apparatus of claim 1, further including an alkaline earth element substituted for at least one atom of said rare earth or rare earth-like element in said composition.

CLAIM 3 The superconducting apparatus of claim 2, where said transition metal is Cu.

CLAIM 4 The superconducting apparatus of claim 3, where said alkaline earth element is selected from the group consisting of B, Ca, Ba, and Sr.

CLAIM 5 The superconducting apparatus of claim 1, where said transition metal element is selected from the group consisting of Cu, Ni, and Cr.

CLAIM 6 The superconducting apparatus of claim 2, where said rare earth or rare earth-like element is selected from the group consisting of La, Nd, and Ce.

CLAIM 7 The superconducting apparatus of claim 1, where said phase is crystalline with a perovskite-like structure.

CLAIM 8 The superconducting apparatus of claim 2, where said phase is crystalline with a perovskite-like structure.

CLAIM 9 The superconducting apparatus of claim 1, where said phase exhibits a layer-like crystalline structure.

CLAIM 10 The superconducting apparatus of claim 1, where said phase is a mixed copper oxide phase.

CLAIM 11 The superconducting apparatus of claim 1, where said composition is comprised of mixed oxides with alkaline earth doping.

CLAIM 12 A superconducting combination, comprising a superconductive oxide having a transition temperature greater than or equal to 26°K,

means for passing a superconducting electrical current through said composition while said composition is at a temperature greater than or equal to 26°K and less than said transition temperature, and

cooling means for cooling said composition to a superconducting state at a temperature greater than or equal to 26°K.

CLAIM 13 The combination of claim 12, where said superconductive composition includes a transition metal oxide.

CLAIM 14 The combination of claim 12, where said superconductive composition includes Cu-oxide.

CLAIM 15 The combination of claim 12, where said superconductive composition includes a multivalent transition metal, oxygen, and at least one additional element.

CLAIM 16 The combination of claim 15, where said transition metal is Cu.

CLAIM 17 The combination of claim 15, where said additional element is a rare earth or rare earth-like element.

CLAIM 18 The combination of claim 15, where said additional element is an alkaline earth element.

CLAIM 19 The combination of claim 12, where said composition includes a perovskite-like superconducting phase.

CLAIM 20 The combination of claim 12, where said composition includes a substituted transition metal oxide.

CLAIM 21 The combination of claim 20, where said substituted transition metal oxide includes a multivalent transition metal element.

CLAIM 22 The combination of claim 20, where said substituted transition metal oxide is an oxide of copper.

CLAIM 23 The combination of claim 20, where said substituted transition metal oxide has a layer-like structure.

CLAIM 24 An apparatus comprising:

a transition metal oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to of 26°K,

means for lowering the temperature of said material at least to said critical temperature to produce said superconducting state in said phase, and

means for passing an electrical superconducting current through said transition metal oxide while it is in said superconducting state.

CLAIM 25 The apparatus of claim 24, where said transition metal oxide is comprised of a transition metal capable of exhibiting multivalent states.

CLAIM 26 The apparatus of claim 24, where said transition metal oxide is comprised of a Cu oxide.

CLAIM 27 A superconducting apparatus comprising a composition having a transition temperature greater than or equal to 26°K, said composition being a substituted Cu-oxide including a superconducting phase having a structure which is structurally substantially similar to the orthorhombic-tetragonal phase of said composition, means for maintaining said composition at a temperature greater than or equal to said transition temperature to put said composition in a superconducting state; and means for passing current through said composition while in said superconducting state.

CLAIM 28 The superconducting apparatus of claim 27, where said substituted Cu-oxide includes a rare earth or rare earth-like element.

CLAIM 29 The superconducting apparatus of claim 27, where said substituted Cu-oxide includes an alkaline earth element.

CLAIM 30 The superconducting apparatus of claim 29, where said alkaline earth element is atomically large with respect to Cu.

CLAIM 31 The superconducting apparatus of claim 27, where said composition has a crystalline structure which enhances electron-phonon interactions to produce superconductivity at a temperature greater than or equal to 26°K.

CLAIM 32 The superconducting apparatus of claim 31, where said crystalline structure is layer-like, enhancing the number of Jahn-Teller polarons in said composition.

CLAIM 33 A superconducting apparatus comprising a composition having a superconducting onset temperature greater than or equal to 26°K, the composition being comprised of a copper oxide doped with an alkaline earth element where the concentration of said alkaline earth element is near to the concentration of said alkaline earth element where the superconducting copper oxide phase in said composition undergoes an orthorhombic to tetragonal structural phase transition.

CLAIM 34 A superconducting apparatus having a superconducting onset temperature greater than or equal to 26°K, the composition being comprised of a mixed copper oxide doped with an element chosen to result in Cu^{3+} ions in said composition and a means for passing a superconducting current through said superconducting composition.

CLAIM 35 The superconducting apparatus of claim 34, where said doping element includes an alkaline earth element.

CLAIM 36 A combination comprising:

a composition having a superconducting onset temperature greater than or equal to 26°K, said composition being comprised of a substituted copper oxide exhibiting mixed valence states and at least one other element in its crystalline structure,

means for passing a superconducting electrical current through said composition while said composition is at a temperature greater than or equal to 26°K and less than said superconducting onset temperature, and

cooling means for cooling said composition to a superconducting state at a temperature greater than or equal to 26°K.

CLAIM 37 The combination of claim 36, where said at least one other element is an alkaline earth element.

CLAIM 38 The combination of claim 36, where said at least one other element is an element which results in Cu^{3+} ions in said composition.

CLAIM 39 The combination of claim 36, where said at least one other element is an element chosen to result in the presence of both Cu^{2+} and Cu^{3+} ions in said composition.

CLAIM 40 An apparatus comprising a superconductor exhibiting a superconducting onset at an onset temperature greater than or equal to 26°K, said superconductor being comprised of at least four elements, none of which is itself superconducting at a temperature greater than or equal to 26°K, means for maintaining said superconductor at an operating temperature in excess of said onset temperature to maintain said superconductor in a superconducting state and means for passing current through said superconductor while in said superconducting state.

CLAIM 41 The apparatus of claim 40, where said elements include a transition metal and oxygen.

CLAIM 42 A apparatus having a superconducting onset temperature greater than or equal to 26°K, said superconductor being a doped transition metal oxide,

where said transition metal is itself non-superconducting and means for passing a superconducting electric current through said composition.

CLAIM 43 The apparatus of claim 42, where said doped transition metal oxide is multivalent in said superconductor.

CLAIM 44 The apparatus of claim 42, further including an element which creates a mixed valent state of said transition metal.

CLAIM 45 The apparatus of claim 43, where said transition metal is Cu.

CLAIM 46 An apparatus having a superconductor having a superconducting onset temperature greater than or equal to 26°K, said superconductor being an oxide having multivalent oxidation states and including a metal, said oxide having a crystalline structure which is oxygen deficient and a means for passing a superconducting electric current through said superconductor.

CLAIM 47 The apparatus of claim 46, where said transition metal is Cu.

CLAIM 48 A superconductive apparatus comprising a superconductive composition comprised of a transition metal oxide having substitutions therein, the amount of said substitutions being sufficient to produce sufficient electron-phonon interactions in said composition that said composition exhibits a superconducting onset at temperatures greater than or equal to 26°K, and a source of current for passing a superconducting electric current through said superconductor.

CLAIM 49 The superconductive apparatus of claim 48, where said transition metal oxide is multivalent in said composition.

CLAIM 50 The superconductive apparatus of claim 48, where said transition metal is Cu.

CLAIM 51 The superconductive apparatus of claim 48, where said substitutions include an alkaline earth element.

CLAIM 52 The superconductive apparatus of claim 48, where said substitutions include a rare earth or rare earth-like element.

CLAIM 53 A superconductive apparatus comprised of a copper oxide having a layer-like crystalline structure and at least one additional element substituted in said crystalline structure, said structure being oxygen deficient and exhibiting a superconducting onset temperature greater than or equal to 26°K.

CLAIM 54 The superconductor of claim 53, where said additional element creates a mixed valent state of said copper oxide in said superconductor.

CLAIM 55 A combination, comprising:

a transition metal oxide having an superconducting onset temperature greater than about 26°K and having an oxygen deficiency, said transition metal being non-superconducting at said superconducting onset temperature and said oxide having multivalent states,

means for passing an electrical superconducting current through said oxide while said oxide is at a temperature greater than or equal to 26°K, and

cooling means for cooling said oxide in a superconducting state at a temperature greater than or equal to 26°K.

CLAIM 56 The combination of claim 55, where said transition metal is Cu.

CLAIM 57 A combination including;

a superconducting oxide having a superconducting onset temperature greater than or equal to 26°K and containing at least 3 elements which are non-superconducting at said onset temperature,

means for passing a superconducting current through said oxide while said oxide is maintained at a temperature greater than or equal to 26°K, and

means for maintaining said oxide in a superconducting state at a temperature greater than or equal to 26°K and less than said superconductive onset temperature.

CLAIM 58 A combination, comprised of:

a copper oxide superconductor having a superconductor onset temperature greater than about 26°K including an element which results in a mixed valent state in said oxide, said oxide being crystalline and having a layer-like structure,

means for passing a superconducting current through said copper oxide while it is maintained at a temperature greater than or equal to 26°K and less than said superconducting onset temperature, and

means for cooling said copper oxide to a superconductive state at a temperature greater than or equal to 26°K and less than said superconducting onset temperature.

CLAIM 59 A combination, comprised of:

a ceramic-like material having an onset of superconductivity at an onset temperature greater than or equal to 26°K,

means for passing a superconducting electrical current through said ceramic-like material while said material is maintained at a temperature greater than or equal to 26°K and less than said onset temperature, and

means for cooling said superconducting ceramic-like material to a superconductive state at a temperature greater than or equal to 26°K and less than said onset temperature, said material being superconductive at temperatures below said onset temperature and a ceramic at temperatures above said onset temperature.

CLAIM 60 An apparatus comprised of a transition metal oxide, and at least one additional element, said superconductor having a distorted crystalline structure characterized by an oxygen deficiency and exhibiting a superconducting onset temperature greater than or equal to of 26°K, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature at a temperature greater than or equal to 26°K.

CLAIM 61 The apparatus of claim 60, where said transition metal is Cu.

CLAIM 62 An apparatus comprised of a transition metal oxide and at least one additional element, said superconductor having a distorted crystalline structure characterized by an oxygen excess and exhibiting a superconducting onset temperature greater than or equal to 26°K, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature greater than or equal to of 26°K.

CLAIM 63 The apparatus of claim 62, where said transition metal is Cu.

CLAIM 64 A combination, comprising:

a mixed copper oxide composition having enhanced polaron formation, said composition including an element causing said copper to have a mixed valent state in said composition, said composition further having a distorted octahedral oxygen environment leading to a T_c greater than or equal to 26°K,

means for providing a superconducting current through said composition at temperatures greater than or equal to 26°K and less than said T_c, and

cooling means for cooling said composition to a temperature greater than or equal to 26°K and less than said T_c.

CLAIM 65 (ALLOWED) An apparatus comprising a composition exhibiting superconductivity at temperatures greater than or equal to 26°K, said composition being a ceramic-like material in the RE-AE-TM-O system, where RE is a rare earth or near rare earth element, AE is an alkaline earth element, TM is a multivalent transition metal element having at least two valence states in said composition, and O is oxygen, the ratio of the amounts of said transition metal in said two valence states being determined by the ratio RE : AE, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature greater than or equal to 26°K.

CLAIM 66 An apparatus comprising a superconductive composition having a transition temperature greater than or equal to 26°K, the composition including a multivalent transition metal oxide and at least one additional element, said composition having a distorted orthorhombic crystalline structure, a source of current for passing a superconducting electric current in said transition metal

oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature greater than or equal to 26°K.

CLAIM 67 The apparatus of claim 66, where said transition metal oxide is a mixed copper oxide.

CLAIM 68 The apparatus of claim 67, where said one additional element is an alkaline earth element.

CLAIM 69 A superconductive combination, comprising:

a superconducting composition exhibiting a superconducting transition temperature greater than or equal to 26°K, said composition being a transition metal oxide having a distorted orthorhombic crystalline structure, and

means for passing a superconducting electrical current through said composition while said composition is at a temperature greater than or equal to 26°K and less than said superconducting transition temperature.

CLAIM 70 The combination of claim 69, where said transition metal oxide is a mixed copper oxide.

CLAIM 71 The combination of claim 70, where said mixed copper oxide includes an alkaline earth element.

CLAIM 72 The combination of claim 71, where said mixed copper oxide further includes a rare earth or rare earth-like element.

CLAIM 73 (WITHDRAWN) An apparatus comprising a composition of matter comprising a superconducting onset temperature greater than or equal to 26°K, said composition of matter made by a method comprising the steps of:

preparing powders of oxygen-containing compounds of a rare earth or rare earth-like element, an alkaline earth element, and copper,

mixing said compounds and firing said mixture to create a mixed copper oxide composition including said alkaline earth element and said rare earth or rare earth-like element, and

annealing said mixed copper oxide composition at an elevated temperature less than about 950°C in an atmosphere including oxygen to produce a superconducting composition having a mixed copper oxide phase exhibiting a superconducting onset temperature greater than or equal to 26°K, said superconducting composition having a layer-like crystalline structure after said annealing step.

CLAIM 74 (WITHDRAWN) The method of claim 73, where the amount of oxygen incorporated into said composition is adjusted by said annealing step, the amount of oxygen therein affecting the critical temperature T_c of the superconducting composition.

CLAIM 75 (WITHDRAWN) An apparatus comprising a composition of matter for carrying a superconductive current comprising a superconducting onset temperature greater than or equal to 26°K, said superconductor being comprised of a rare earth or rare earth-like element (RE), an alkaline earth element (AE), copper (CU), and oxygen (O) and having the general formula RE-AE-CU-O, said composition being made by a method including the steps of combining said rare earth or rare earth-like element, said alkaline earth element and said copper in the presence of oxygen to produce a mixed copper oxide including said rare earth or rare earth-like element and said alkaline earth element therein, and

heating said mixed copper oxide to produce a superconductor having a crystalline layer-like structure and exhibiting a superconducting onset temperature greater than or equal to 26°K the critical transition temperature of said superconductor being dependent on the amount of said alkaline earth element therein.

CLAIM 76 (WITHDRAWN) The apparatus of claim 75, where said heating step is done in an atmosphere including oxygen.

CLAIM 77 (ALLOWED) A combination, comprising:

a mixed copper oxide composition including an alkaline earth element (AE) and a rare earth or rare earth-like element (RE), said composition having a layer-like crystalline structure and multi-valent oxidation states, said composition exhibiting *a* substantially zero resistance to the flow of electrical current therethrough when cooled to a superconducting state at a temperature greater than or equal to 26°K, said mixed copper oxide having a superconducting onset temperature greater than or equal to 26°K, and

electrical means for passing an electrical superconducting current through said composition when said composition exhibits substantially zero resistance at a temperature greater than or equal to 26°K and less than said onset temperature.

CLAIM 78 (ALLOWED) The combination of claim 77, where the ratio (AE,RE) : Cu is substantially 1:1.

CLAIM 79 (ALLOWED) The combination of claim 77, where the ratio (AE,RE) : Cu is substantially 1:1.

CLAIM 80 (ALLOWED) The combination of claim 77, wherein said crystalline structure is perovskite-like.

CLAIM 81 (ALLOWED) The combination of claim 77, where said mixed copper oxide composition has a non-stoichiometric amount of oxygen therein.

CLAIM 82 (WITHDRAWN) An apparatus comprising a superconductor comprising a superconducting onset temperature greater than or equal to 26°K, said superconductor being comprised of a rare earth or rare earth-like element (RE), an alkaline earth element (AE), a transition metal element (TM), and Oxygen (O) and having the general formula RE-AE-TM-O, said superconductor being made by a method including the steps of combining said rare earth or rare earth-like element, said alkaline earth element and said transition metal element in the presence of oxygen to produce a mixed transition metal oxide including said rare earth or rare earth-like element and said alkaline earth element therein, and

heating said mixed transition metal oxide to produce superconductor having a crystalline layer-like structure and exhibiting a superconducting onset temperature greater than or equal to 26°K, said superconductor having a non-stoichiometric amount of oxygen therein.

CLAIM 83 (WITHDRAWN) The apparatus of claim 82, where said transition metal is copper.

CLAIM 84 A superconducting combination, comprising:

a mixed transition metal oxide composition containing a non-stoichiometric amount of oxygen therein, a transition metal and at least one additional element, said composition having substantially zero resistance to the flow of electricity therethrough when cooled to a superconducting state at a temperature greater than or equal to 26°K, said mixed transition metal oxide has a superconducting onset temperature greater than or equal to 26°K, and

electrical means for passing an electrical superconducting current through said composition when said composition is in said superconducting state at a temperature greater than or equal to 26°K, and less than said superconducting onset temperature.

CLAIM 85 The combination of claim 84, where said transition metal is copper.

CLAIM 86 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or rare earth-like element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting onset temperature greater than or equal to 26°K,

means for maintaining said composition to said superconducting state at a temperature greater than or equal to 26°K and less than said superconducting onset temperature, and

means for passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 87 (ALLOWED) The apparatus of claim 86, where said transition metal is copper.

CLAIM 88 An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a cooler for cooling said composition to a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a current source for passing an electrical current through said composition while said composition is in said superconductive state.

CLAIM 89 The apparatus of claim 88, where said composition is comprised of a metal oxide.

CLAIM 90 The apparatus of claim 88, where said composition is comprised of a transition metal oxide.

CLAIM 91 A combination, comprising:

a composition exhibiting the onset of a DC substantially zero resistance state at an onset temperature in excess of 30°K, and

means for passing an electrical current through said composition while it is in said substantially zero resistance state.

CLAIM 92 The combination of claim 91, where said composition is a copper oxide.

CLAIM 93 An apparatus, comprising:

a mixed copper oxide material exhibiting an onset of superconductivity at an onset temperature greater than or equal to 26°K, and

means for producing an electrical current through said copper oxide material while it is in a superconducting state at a temperature greater than or equal to 26°K.

CLAIM 94 The apparatus of claim 93, where said copper oxide material exhibits a layer-like crystalline structure.

CLAIM 95 The apparatus of claim 93, where said copper oxide material exhibits a mixed valence state.

CLAIM 96 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition comprising a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) means for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element.

CLAIM 97 (ALLOWED) The superconductive apparatus according to claim 96 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or rare-earth-like element and at least one alkaline-earth element.

CLAIM 98 (ALLOWED) The superconductive apparatus according to claim 97 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 99 (ALLOWED) The superconductive apparatus according to claim 97 in which the alkaline-earth element is barium.

CLAIM 100 The superconductive apparatus according to claim 96 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 101 The superconductive apparatus according to claim 100 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 102 The superconductive apparatus according to claim 101 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 103 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) means for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$ of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element.

CLAIM 104 (ALLOWED) The superconductive apparatus according to claim 103 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 105 (ALLOWED) The superconductive apparatus according to claim 103 in which the alkaline-earth element is barium.

CLAIM 106 (ALLOWED) The superconductive apparatus according to claim 103 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 107 (ALLOWED) The superconductive apparatus according to claim 106 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 108 (ALLOWED) The superconductive apparatus according to claim 107 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 109 A superconductive apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or alkaline earth element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, means for maintaining said composition at said temperature to exhibit said

superconductivity and means for passing an electrical superconducting current through said composition while exhibiting said superconductivity.

CLAIM 110 The combination of claim 15, where said additional element is rare earth or alkaline earth element.

CLAIM 111 A device comprising a superconducting transition metal oxide having a superconductive onset temperature greater than or equal to 26°K, said superconducting transition metal oxide being at a temperature less than said superconducting onset temperature and having a superconducting current flowing therein.

CLAIM 112 A device comprising a superconducting copper oxide having a superconductive onset temperature greater than or equal to 26°K, said superconducting copper oxide being at a temperature less than said superconducting onset temperature and having a superconducting current flowing therein.

CLAIM 113 (ALLOWED) A device comprising a superconducting oxide composition having a superconductive onset temperature greater than or equal to 26°K, said superconducting copper oxide being at a temperature less than said superconducting onset temperature and having a superconducting current flowing therein, said composition comprising at least one each of rare earth, an alkaline earth, and copper.

CLAIM 114 (ALLOWED) A device comprising a superconducting oxide composition having a superconductive onset temperature greater than or equal to 26°K, said superconducting copper oxide being at a temperature less than said superconducting onset temperature and having a superconducting current flowing therein, said composition comprising at least one each of a group IIIB element, an alkaline earth, and copper.

CLAIM 115 A device comprising a transition metal oxide having a T_c greater than or equal to 26°K carrying a superconducting current said transition metal oxide is maintained at a temperature less than said T_c.

CLAIM 116 An apparatus comprising a transition metal oxide having a T_c greater than or equal to 26°K carrying a superconducting current said transition metal oxide is maintained at a temperature less than said T_c.

CLAIM 117 A structure comprising a transition metal oxide having a T_c greater than or equal to 26°K carrying a superconducting current.

CLAIM 118 An apparatus comprising a transition metal oxide having a T_c greater than or equal to 26°K carrying a superconducting current.

CLAIM 119 A device comprising a copper oxide having a T_c greater than or equal to 26°K carrying a superconducting current said copper oxide is maintained at a temperature less than said T_c.

CLAIM 120 An apparatus comprising a copper oxide having a T_c greater than or equal to 26°K carrying a superconducting current said copper oxide is maintained at a temperature less than said T_c.

CLAIM 121 A device comprising a copper oxide having a T_c greater than or equal to 26°K carrying a superconducting current.

CLAIM 122 An apparatus comprising a copper oxide having a T_c greater than or equal to 26°K carrying a superconducting current.

CLAIM 123 (ALLOWED) A superconductive apparatus comprising:

a composition of the formula $Ba_xLa_{x-5}Cu_5O_Y$ wherein x is from about 0.75 to about 1 and
y is the oxygen deficiency resulting from annealing said composition at temperatures from about 540°C to about 950°C and for times of about 15 minutes to about 12 hours, said composition having a metal oxide phase which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a means for maintaining the temperature of said composition at a temperature less than
said critical temperature to induce said superconducting state in said metal oxide phase; and

a means for passing an electrical current through said composition while said metal oxide phase is in said superconducting state.

CLAIM 124 (ALLOWED) A device comprising a composition of matter having a T_c greater than or equal to 26°K carrying a superconducting current, said composition comprising at least one each of a IIIB element, an alkaline earth, and copper oxide said device is maintained at a temperature less than said T_c.

CLAIM 125 (ALLOWED) An apparatus comprising a composition of matter having a T_c greater than or equal to 26°K carrying a superconducting current, said composition comprising at least one each of a rare earth, an alkaline earth, and copper oxide.

CLAIM 126 A device comprising a composition of matter having a T_c greater than or equal to 26°K carrying a superconducting current, said composition comprising at least one each of a rare earth, and copper oxide.

CLAIM 127 A device comprising a composition of matter having a T_c greater than or equal to 26°K carrying a superconducting current, said composition comprising at least one each of a IIIB element, and copper oxide.

CLAIM 128 A transition metal oxide device comprising a T_c greater than or equal to 26°K and carrying a superconducting current.

CLAIM 129 A copper oxide device comprising a T_C greater than or equal to 26°K and carrying a superconducting current.

CLAIM 130 A superconductive apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or Group III B element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a means for maintaining said composition at said temperature to exhibit said superconductivity and means for passing an electrical superconducting current through said composition which exhibiting said superconductivity.

CLAIM 131 The combination of claim 15, where said additional element is a rare earth or Group III B element.

CLAIM 132 The combination of claim 12, where said composition includes a substantially perovskite superconducting phase.

CLAIM 133 The superconducting apparatus of claim 27, where said substituted Cu-oxide includes a rare earth or Group III B element.

CLAIM 134 The combination of claim 71, where said mixed copper oxide further includes a rare earth or Group III B element.

CLAIM 135 (ALLOWED) A combination, comprising:

a mixed copper oxide composition including an alkaline earth element (AE) and a rare earth or Group III B element (RE), said composition having a substantially layered crystalline structure and multi-valent oxidation states, said composition exhibiting a substantially zero resistance to the flow of electrical current therethrough when in a superconducting state at a temperature greater than or equal to 26°K, said mixed copper oxide having a superconducting onset temperature greater than or equal to 26°K and,

electrical means for passing an electrical superconducting current through said composition when said composition exhibits substantially zero resistance at a temperature greater than or equal to 26°K and less than said onset temperature.

CLAIM 136 (ALLOWED) The combination of claim 77, where said crystalline structure is substantially perovskite.

CLAIM 137 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or Group III B element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichimetric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

means for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and less than said superconducting onset temperature, and

means for passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 138 (ALLOWED) The apparatus of claim 93, where said copper oxide material exhibits a substantially layered crystalline structure.

CLAIM 139 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) means for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element.

CLAIM 140 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including at least one rare-earth or Group III B element and at least one alkaline-earth element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{r=o}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) means for maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{r=o}$ of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element.

CLAIM 141 An apparatus comprising a transition metal oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K,

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase, and

a current source passing an electrical supercurrent through said transition metal oxide while it is in said superconducting state.

CLAIM 142 The apparatus of claim 141, where said transition metal oxide is comprised of a transition metal capable of exhibiting multivalent states.

CLAIM 143 The apparatus of claim 141, where said transition metal oxide is comprised of a Cu oxide.

CLAIM 144 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or rare earth-like element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 145 (ALLOWED) The apparatus of claim 144, where said transition metal is copper.

CLAIM 146 An apparatus:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a current source passing an electrical current through said composition while said composition is in said superconductive state.

CLAIM 147 The apparatus of claim 146, where said composition is comprised of a metal oxide.

CLAIM 148 The apparatus of claim 146, where said composition is comprised of a transition metal oxide.

CLAIM 149 A superconductive apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) causing an electric current to flow in the superconductor element.

CLAIM 150 (ALLOWED) The superconductive apparatus according to claim 149 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or rare-earth-like element and at least one alkaline-earth element.

CLAIM 151 (ALLOWED) The superconductive apparatus according to claim 150 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 152 (ALLOWED) The superconductive apparatus according to claim 150 in which the alkaline-earth element is barium.

CLAIM 153 The superconductive apparatus according to claim 149 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 154 The superconductive apparatus according to claim 153 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 155 The superconductive apparatus according to claim 154 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 156 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition having a superconductive/resistive-transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 157 (ALLOWED) The superconductive apparatus according to claim 156 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 158 (ALLOWED) The superconductive apparatus according to claim 156 in which the alkaline-earth element is barium.

CLAIM 159 (ALLOWED) The superconductive apparatus according to claim 156 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 160 (ALLOWED) The superconductive apparatus according to claim 159 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 161 (ALLOWED) The superconductive apparatus according to claim 160 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 162 An apparatus comprising copper oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element.

CLAIM 163 An apparatus comprising:

a composition comprising copper, oxygen and any element selected from the group consisting of a Group II A element, a rare earth element and a Group III B

element, where said composition is a mixed copper oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 164 An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and an element selected from the group consisting of Group II A element, a rare earth element and a Group III B element.

CLAIM 165 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound

having a layer-type perovskite-like crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 166 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=o}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 167 (ALLOWED) An apparatus comprising:

a copper oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 168 (ALLOWED) An apparatus comprising:

a composition including copper, oxygen and an element selected from the group consisting of at least one Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed copper oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 169 (ALLOWED) An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and at least one element selected from the group consisting of Group II A and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 170 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the

group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 171 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 172 (ALLOWED) An apparatus comprising:

a transition metal oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said transitional metal oxide includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 173 (ALLOWED) An apparatus comprising:

a composition including a transition metal, oxygen and an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed transitional metal oxide formed from said transition metal and said oxygen, said mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 174 (ALLOWED) An apparatus:

forming a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a transitional metal oxide and at least one element selected from the group consisting of Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 175 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 176 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound having a layer-type perovskite-like crystal structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 177 (ALLOWED) An apparatus comprising:

a copper oxide having a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 178 (ALLOWED) An apparatus comprising:

a composition including copper, oxygen, a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed copper oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 179 (ALLOWED) A structure comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide, a Group II A element, at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 180 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 181 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive-resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 182 An apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or alkaline earth element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a temperature controller maintaining said composition at said temperature to exhibit said superconductivity and a current source passing an electrical superconducting

current through said composition with said phrase exhibiting said superconductivity.

CLAIM 183 An apparatus comprising a superconducting transition metal oxide having a superconductive onset temperature greater than or equal to 26°K, a temperature controller maintaining said superconducting transition metal oxide at a temperature less than said superconducting onset temperature and a current source flowing a superconducting current therein.

CLAIM 184 An apparatus comprising a superconducting copper oxide having a superconductive onset temperature greater than or equal to 26°K, a temperature controller maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a current source flowing a superconducting current in said superconducting oxide.

CLAIM 185 (ALLOWED) An apparatus comprising a superconducting oxide composition having a superconductive onset temperature greater than or equal to 26°K, a temperature controller maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a current source flowing a superconducting current therein, said composition comprising at least one each of rare earth, an alkaline earth, and copper.

CLAIM 186 (ALLOWED) An apparatus comprising a superconducting oxide composition having a superconductive onset temperature greater than or equal to 26°K, a temperature controller maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a current source flowing a superconducting electrical current therein, said composition comprising at least one each of a Group III B element, an alkaline earth, and copper.

CLAIM 187 An apparatus comprising a superconducting electrical current in a transition metal oxide having a T_c greater than or equal to 26°K and maintaining said transition metal oxide at a temperature less than said T_c.

CLAIM 188 An apparatus comprising a current source flowing a superconducting current in a copper oxide having a T_c greater than or equal to 26°K and a temperature controller maintaining said copper oxide at a temperature less than said T_c.

CLAIM 189 (ALLOWED) An apparatus comprising:

a composition of the formula $BaLa_{5-x}Cu_5O_{5(3-y)}$, wherein x is from about 0.75 to about 1 and y is the oxygen deficiency resulting from annealing said composition at temperatures from about 540°C to about 950°C and for times of about 15 minutes to about 12 hours, said composition having a metal oxide phase which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller maintaining the temperature of said composition at a temperature less than said critical temperature to induce said superconducting state in said metal oxide phase; and

a current source passing an electrical current through said composition while said metal oxide phase is in said superconducting state.

CLAIM 190 (ALLOWED) An apparatus comprising a current source flowing a superconducting electrical current in a composition of matter having a T_c greater than or equal to 26°K, said composition comprising at least one each of a Group III B element, an alkaline earth, and copper oxide and a temperature controller maintaining said composition of matter at a temperature less than T_c.

CLAIM 191 (ALLOWED) An apparatus comprising a current source flowing a superconducting electrical current in a composition of matter having a T_c greater than or equal to 26°K, said composition comprising at least one each of a rare earth, alkaline earth, and copper oxide and a temperature controller maintaining said composition of matter at a temperature less than said T_c.

CLAIM 192 An apparatus comprising a current source flowing a superconducting electrical current in a composition of matter having a T_c greater than or equal to 26°K, said composition comprising at least one each of a rare earth, and copper oxide and a temperature controller maintaining said composition of matter at a temperature less than said T_c.

CLAIM 193 An apparatus comprising a current source flowing a superconducting electrical current in a composition of matter having a T_c greater than or equal to 26°K carrying, said composition comprising at least one each of a Group III B element, and copper oxide and a temperature controller maintaining said composition of matter at a temperature less than said T_c.

CLAIM 194 An apparatus comprising a current source flowing a superconducting electrical current in a transition metal oxide comprising a T_c greater than or equal to 26°K and a temperature controller maintaining said transition metal oxide at a temperature less than said T_c.

CLAIM 195 An apparatus comprising a current source flowing a superconducting electrical current in a copper oxide composition of matter comprising a T_c greater than or equal to 26°K and a temperature controller maintaining said copper oxide composition of matter at a temperature less than said T_c.

CLAIM 196 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a Group III B element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 197 (ALLOWED) The apparatus of claim 196, where said transition metal is copper.

CLAIM 198 A superconductive apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 199 The superconductive apparatus according to claim 198 in which the copper-oxide compound of the superconductive composition includes at least one element selected from the group consisting of a rare-earth element, a Group III B element and an alkaline-earth element.

CLAIM 200 The superconductive apparatus according to claim 199 in which the rare-earth is lanthanum.

CLAIM 201 The superconductive apparatus according to claim 199 in which the alkaline-earth element is barium.

CLAIM 202 The superconductive apparatus according to claim 198 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 203 The superconductive apparatus according to claim 202 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 204 The superconductive apparatus according to claim 203 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 205 A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a rare-earth element, a Group III B element and an alkaline-earth element, the

composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 206 The superconductive apparatus according to claim 205 in which said at least one element is lanthanum.

CLAIM 207 The superconductive apparatus according to claim 205 in which the alkaline-earth element is barium.

CLAIM 208 The superconductive apparatus according to claim 205 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 209 The superconductive apparatus according to claim 208 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 210 The superconductive apparatus according to claim 209 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 211 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 212 A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an

effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=o}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 213 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 214 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 215 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 216 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound having a substantially layered perovskite crystal structure, the transition metal-oxide compound including a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 217 An apparatus according to claim 182 wherein said composition comprises a substantially layered perovskite crystal structure.

CLAIM 218 An apparatus according to claim 183 wherein said superconducting transition metal oxide comprises a substantially layered perovskite crystal structure.

CLAIM 219 An apparatus according to claim 184 wherein said superconducting copper oxide comprises a substantially layered perovskite crystal structure.

CLAIM 220 (ALLOWED) An apparatus according to claim 185 wherein said superconducting oxide composition comprises a substantially layered perovskite crystal structure.

CLAIM 221 (ALLOWED) An apparatus according to claim 186 wherein said superconducting oxide composition comprises a substantially layered perovskite crystal structure.

CLAIM 222 An apparatus according to claim 187 wherein said transition metal oxide comprises a substantially layered perovskite crystal structure.

CLAIM 223 An apparatus according to claim 188 wherein said copper oxide comprises a substantially layered perovskite crystal structure.

CLAIM 224 (ALLOWED) An apparatus according to claim 189 wherein said composition comprises a substantially layered perovskite crystal structure.

CLAIM 225 (ALLOWED) An apparatus according to claim 190 wherein said composition of matter comprises a substantially layered perovskite crystal structure.

CLAIM 226 (ALLOWED) An apparatus according to claim 191 wherein said composition of matter comprises substantially layered perovskite crystal structure.

CLAIM 227 An apparatus according to claim 192 wherein said composition of matter comprises a substantially layered perovskite crystal structure.

CLAIM 228 An apparatus according to claim 193 wherein said composition of matter comprises substantially layered perovskite crystal structure.

CLAIM 229 An apparatus according to claim 194 wherein said transition metal oxide comprises substantially layered perovskite crystal structure.

CLAIM 230 An apparatus according to claim 195 wherein said copper oxide composition comprises substantially layered perovskite crystal structure.

CLAIM 231 (ALLOWED) An apparatus comprising a composition of matter having a T_c greater than or equal to 26°K carrying a superconducting current, said composition comprising at least one each of a rare earth, an alkaline earth, and copper oxide.

CLAIM 232 An apparatus comprising:

a transition metal oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K,

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase, and

a source of an electrical supercurrent through said transition metal oxide while it is in said superconducting state.

CLAIM 233 An apparatus according to claim 232, where said transition metal oxide is comprised of a transition metal capable of exhibiting multivalent states.

CLAIM 234 An apparatus according to claim 232, where said transition metal oxide is comprised of a Cu oxide.

CLAIM 235 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or rare earth-like element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 236 (ALLOWED) An apparatus according to claim 235, where said transition metal is copper.

CLAIM 237 An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a source of an electrical current through said composition while said composition is in said superconductive state.

CLAIM 238 An apparatus according to claim 237, where said composition is comprised of a metal oxide.

CLAIM 239 An apparatus according to claim 238, where said composition is comprised of a transition metal oxide.

CLAIM 240 An apparatus capable of carrying electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 241 (ALLOWED) An apparatus according to claim 240 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or rare-earth-like element and at least one alkaline-earth element.

CLAIM 242 (ALLOWED) An apparatus according to claim 241 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 243 (ALLOWED) An apparatus according to claim 241 in which the alkaline-earth element is barium.

CLAIM 244 An apparatus according to claim 240 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 245 An apparatus according to claim 244 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 246 An apparatus according to claim 245 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 247 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 248 (ALLOWED) An apparatus according to claim 247 in which the rare-earth or rare-earth-like element is lanthanum.

CLAIM 249 (ALLOWED) An apparatus according to claim 247 in which the alkaline-earth element is barium.

CLAIM 250 (ALLOWED) An apparatus according to claim 247 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 251 (ALLOWED) An apparatus according to claim 250 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 252 (ALLOWED) An apparatus according to claim 251 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 253 An apparatus comprising:

a copper oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a source of an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element.

CLAIM 254 An apparatus comprising:

a composition including copper, oxygen and an element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, where said composition is a mixed copper oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 255 An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a source of an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and an element selected from the group consisting of Group II A element, a rare earth element and a Group III B element.

CLAIM 256 An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 257 An apparatus capable of carrying an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 258 (ALLOWED) An apparatus comprising:

a copper oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a source of an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 259 (ALLOWED) An apparatus comprising:

a composition including copper, oxygen and an element selected from the group consisting of at least one Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed copper oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 260 (ALLOWED) An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a source of an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and at least one element selected from the group consisting of Group II A and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 261 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 262 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting

of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 263 (ALLOWED) An apparatus comprising:

a transition metal oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a source of an electrical supercurrent through said transition metal oxide while it is in said superconducting state;

said transitional metal oxide includes at least one element selected from the group consisting of a Group II A element and at lest one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIMS 264 (ALLOWED) An apparatus comprising:

a composition including a transition metal, oxygen and an element selected from the group consisting of at least one Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed transitional metal oxide formed from said transition metal and said oxygen, said mixed transition metal oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 265 (ALLOWED) An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a source of an electrical current through said composition while said composition is in said superconductive state; and

said composition including a transitional metal oxide and at least one element selected from the group consisting of Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

CLAIM 266 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 267 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a layer-type perovskite-like crystal structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an

effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 268 An apparatus comprising:

a copper oxide comprising a phase therein which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a source for an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one element selected from group consisting of a Group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element.

CLAIM 269 (ALLOWED) An apparatus comprising:

a composition including copper, oxygen and an element selected from the group consisting of at least one Group II A element and at least one element selected from the group consisting of a rare earth element at least one element selected

from the group consisting of a Group III B element, where said composition is a mixed copper oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K; and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 270 (ALLOWED) An apparatus comprising:

a composition exhibiting a superconductive state at a temperature greater than or equal to 26°K;

a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state;

a source of an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide and at least one element selected from the group consisting of Group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element.

CLAIM 271 (ALLOWED) An apparatus for causing an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 272 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element, the composition comprising a superconductive-resistive transition temperature defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 273 An apparatus comprising a composition comprising a transition temperature greater than or equal to 26°K, the composition including a rare earth or alkaline earth element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at said temperature to exhibit said superconductivity and a source of an electrical superconducting current through said composition with said phrase exhibiting said superconductivity.

CLAIM 274 An apparatus comprising providing a superconducting transition metal oxide comprising a superconductive onset temperature greater than or equal to 26°K, a temperature controller for maintaining said superconducting transition metal oxide at a temperature less than said superconducting onset temperature and a source of a superconducting current therein.

CLAIM 275 An apparatus comprising a superconducting copper oxide comprising a superconductive onset temperature greater than or equal to 26°K, a temperature controller for maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a source of a superconducting current in said superconducting oxide.

CLAIM 276 (ALLOWED) An apparatus comprising a superconducting oxide composition comprising a superconductive onset temperature greater than or equal to 26°K , a temperature controller for maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature

and a source of a superconducting current therein, said composition comprising at least one each of rare earth, an alkaline earth, and copper.

CLAIM 277 (ALLOWED) An apparatus comprising a superconducting oxide composition comprising a superconductive onset temperature greater than or equal to 26°K, a temperature controller for maintaining said superconducting copper oxide at a temperature less than said superconducting onset temperature and a source of a superconducting electrical current therein, said composition comprising at least one each of a Group III B element, an alkaline earth, and copper.

CLAIM 278 An apparatus comprising a source of a superconducting electrical current in a transition metal oxide comprising a T_c greater than or equal to 26°K and a temperature controller for maintaining said transition metal oxide at a temperature less than said T_c.

CLAIM 279 An apparatus comprising a source of a superconducting current in a copper oxide comprising a T_c greater than or equal to 26°K and a temperature controller for maintaining said copper oxide at a temperature less than said T_c.

CLAIM 280 (ALLOWED) An apparatus comprising:

a composition of the formula Ba_xLa_{x-5}, Cu_5O_Y, wherein x is from about 0.75 to about 1 and y is the oxygen deficiency resulting from annealing said composition at temperatures from about 540°C to about 950°C and for times of about 15 minutes to about 12 hours, said composition comprising a metal oxide phase which exhibits a superconducting state at a critical temperature greater than or equal to 26°K;

a temperature controller for maintaining the temperature of said composition at a temperature less than said critical temperature to induce said superconducting state in said metal oxide phase; and

a source of an electrical current through said composition while said metal oxide phase is in said superconducting state.

CLAIM 281 (ALLOWED) An apparatus comprising a source of a superconducting electrical current in a composition of matter comprising a T_c greater than or equal to 26°K, said composition comprising at least one each of a III B element, an alkaline earth, and copper oxide and a temperature controller for maintaining said composition of matter at a temperature less than T_c.

CLAIM 282 (ALLOWED) An apparatus comprising a source of a superconducting electrical current in a composition of matter comprising a T_c greater than or equal to 26°K, said composition comprising at least one each of a rare earth, alkaline earth, and copper oxide and a temperature controller for maintaining said composition of matter at a temperature less than said T_c.

CLAIM 283 An apparatus comprising a source of a superconducting electrical current in a composition of matter comprising a T_c greater than or equal to 26°K, said composition comprising at least one each of a rare earth, and copper oxide and a temperature controller for maintaining said composition of matter at a temperature less than said T_c.

CLAIM 284 An apparatus comprising a source of a superconducting electrical current in a composition of matter comprising a T_c greater than or equal to 26°K carrying, said composition comprising at least one each of a III B element, and copper oxide and a temperature controller for maintaining said composition of matter at a temperature less than said T_c.

CLAIM 285 An apparatus comprising a source of a superconducting electrical current in a transition metal oxide comprising a T_c greater than or equal to 26^{o}K and a temperature controller for maintaining said transition metal oxide at a temperature less than said T_c.

CLAIM 286 An apparatus comprising a source of a superconducting electrical current in a copper oxide composition of matter comprising a T_c greater than or equal to 26^{o}K and a temperature controller for maintaining said copper oxide composition of matter at a temperature less than said T_c.

CLAIM 287 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a group IIIB element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide comprising a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26^{o}K,

a temperature controller for maintaining said composition in said superconducting state at a temperature greater than or equal to 26^{o}K, and

a source of an electrical current through said composition while said composition is in said superconducting state.

CLAIM 288 (ALLOWED) An apparatus according to claim 287, where said transition metal is copper.

CLAIM 289 An apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26^{o}K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound

comprising a substantially layered perovskite crystal structure, the composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K;

b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 290 An apparatus according to claim 289 in which the copper-oxide compound of the superconductive composition includes at least one element selected from the group consisting of a rare-earth element and a Group III B element and at least one alkaline-earth element.

CLAIM 291 An apparatus according to claim 290 in which the rare-earth or element is lanthanum.

CLAIM 292 An apparatus according to claim 290 in which the alkaline-earth element is barium.

CLAIM 293 An apparatus according to claim 289 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 294 An apparatus according to claim 293 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 295 An apparatus according to claim 294 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 296 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a rare-earth element and a Group III B element and at least one alkaline-earth element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 297 (ALLOWED) An apparatus according to claim 296 in which said at least one element is lanthanum.

CLAIM 298 (ALLOWED) An apparatus according to claim 296 in which the alkaline-earth element is barium.

CLAIM 299 (ALLOWED) An apparatus according to claim 296 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

CLAIM 300 (ALLOWED) An apparatus according to claim 299 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

CLAIM 301 (ALLOWED) An apparatus according to claim 300 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

CLAIM 302 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 303 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the copper-oxide

compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and
(c) a source of an electric current to flow in the superconductor element.

CLAIM 304 (ALLOWED) An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to
26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 305 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature Tc and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 306 (ALLOWED) An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a substantially layered perovskite crystal structure, the composition comprising a superconductive transition temperature T_c of greater

than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 307 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a substantially layered perovskite crystal structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 308 An apparatus according to claim 273 wherein said composition comprises a substantially layered perovskite crystal structure.

CLAIM 309 An apparatus according to claim 274 wherein said superconducting transition metal oxide comprises a substantially layered perovskite crystal structure.

CLAIM 310 An apparatus according to claim 275 wherein said superconducting copper oxide comprises a substantially layered perovskite crystal structure.

CLAIM 311 (ALLOWED) An apparatus according to claim 276 wherein said superconducting oxide composition comprises a substantially layered perovskite crystal structure.

CLAIM 312 (ALLOWED) An apparatus according to claim 277 wherein said superconducting oxide composition comprises a substantially layered perovskite crystal structure.

CLAIM 313 An apparatus according to claim 278 wherein said transition metal oxide comprises a substantially layered perovskite crystal structure.

CLAIM 314 An apparatus according to claim 279 wherein said copper oxide comprises a substantially layered perovskite crystal structure.

CLAIM 315 (ALLOWED) An apparatus according to claim 280 wherein said composition comprises a substantially layered perovskite crystal structure.

CLAIM 316 (ALLOWED) An apparatus according to claim 281 wherein said composition of matter comprises a substantially layered perovskite crystal structure.

CLAIM 317 (ALLOWED) An apparatus according to claim 282 wherein said composition of matter comprises substantially layered perovskite crystal structure.

CLAIM 318 An apparatus according to claim 283 wherein said composition of matter comprises a substantially layered perovskite crystal structure.

CLAIM 319 An apparatus according to claim 284 wherein said composition of matter comprises substantially layered perovskite crystal structure.

CLAIM 320 An apparatus according to claim 285 wherein said transition metal oxide comprises substantially layered perovskite crystal structure.

CLAIM 321 An apparatus according to claim 286 wherein said copper oxide composition comprises substantially layered perovskite crystal structure.

CLAIM 322 A superconductive combination according to anyone of claims 84 or 85, wherein said mixed transition metal oxide can be made according to known principles of ceramic science.

CLAIM 323 An apparatus according to anyone of claims 86, 87, 144, 146, 147, 163, 164, 168, 169, 173, 174, 178, 182, 189, 196, 197, 214, 224, 235, 236, 237, 239, 254, 255, 259, 260, 264, 265 or 273, wherein said composition can be made according to known principles of ceramic science.

CLAIM 324 A combination according to anyone of claims 91, 92 or 36 to 39, wherein said composition can be made according to known principles of ceramic science.

CLAIM 325 A superconductive apparatus according to anyone of claims 1 to 11, 33 to 35, 66 to 68,109, 130, 361-366 or 370, wherein said composition can be made according to known principles of ceramic science.

CLAIM 326 An apparatus according to anyone of claims 93 to 95 or 138, wherein said mixed copper oxide can be made according to known principles of ceramic science.

CLAIM 327 A combination according to anyone of claims 64 or 135, wherein said mixed copper oxide can be made according to known principles of ceramic science.

CLAIM 328 A superconductive apparatus according to anyone of claims 48 to 52, 96 to 108, 198 to 204, 371, 383 or 384, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 329 A superconductive combination according to anyone of claims 12 to 23, 110, 131, 132 or 367-370, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 330 (ALLOWED) An apparatus according to anyone of claims 185 or 220, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 331 A device according to claim 111, wherein said superconductive transition metal oxide can be made according to known principles of ceramic science.

CLAIM 332 An apparatus according to anyone of claims 183, 217, 218, 274 or 309, wherein said superconductive transition metal oxide can be made according to known principles of ceramic science.

CLAIM 333 A device according to claim 112, wherein said superconductive copper oxide can be made according to known principles of ceramic science.

CLAIM 334 An apparatus according to anyone of claims 275, 276, 310 or 311, wherein said superconductive copper oxide can be made according to known principles of ceramic science.

CLAIM 335 (ALLOWED) A device according to claim 113, wherein said superconductive oxide composition can be made according to known principles of ceramic science.

CLAIM 336 (ALLOWED) An apparatus according to anyone of claims 186, 221, 272, 312 or 413, wherein said superconductive oxide composition can be made according to known principles of ceramic science.

CLAIM 337 A device according to anyone of claims 114 or 117, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 338 An apparatus according to anyone of claims 24 to 26, 60 to 63, 116, 141 to 143, 172, 187, 222, 232 to 234, 263, 278, 285, 287, 288, 313 or 320, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 339 A superconductive apparatus according to anyone of claims 27-32, 132 or 370, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 340 An invention according to claim 118, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 341 A transition metal oxide device according to claim 128, wherein said transition metal oxide can be made according to known principles of ceramic science.

CLAIM 342 An apparatus according to anyone of claims 40 to 45, wherein said superconductor can be made according to known principles of ceramic science.

CLAIM 343 A device according to anyone of claims 119 or 121, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 344 An apparatus according to claim 120, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 345 An invention according to claim 122, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 346 (ALLOWED) A superconductive apparatus according to claim 123, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 347 A copper oxide device according to claim 129, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 348 An apparatus according to anyone of claims 162, 167, 177, 188, 223, 253, 258, 268, 269, 270, 279 or 314, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 349 A combination according to claim 57, wherein said superconductive oxide can be made according to known principles of ceramic science.

CLAIM 350 A combination according to anyone of claims 58 or 373, wherein said copper oxide conductor can be made according to known principles of ceramic science.

CLAIM 351 A combination according to claim 59, wherein said ceramic-like material can be made according to known principles of ceramic science.

CLAIM 352 A superconductive combination according to anyone of claims 69 to 71 or 134, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 353 A superconductive apparatus according to anyone of claims 139, 140, 149 to 155, 156 to 161, 170, 171, 175, 176, 180, 181, 205 to 216, 387-393, or 396-401, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 354 An apparatus according to anyone of claims 165, 166, 185, 220, 240 to 246, 247 to 252, 261, 262, 289, 290 to 301, 394, 395, 402-406, 409 or 410, wherein said superconductive composition can be made according to known principles of ceramic science.

CLAIM 355 A combination according to anyone of claims 77 to 81, 186, 379 or 380, wherein said mixed copper oxide composition can be made according to known principles of ceramic science.

CLAIM 356 A device according to anyone of claims 124 to 127, wherein said composition of matter can be made according to known principles of ceramic science.

CLAIM 357 An apparatus according to anyone of claims 190 to 194, 225 to 229, 231, 256, 257, 266, 267, 271, 272, 281 to 284, 317 to 319, 407, or 411 to 413,

wherein said composition of matter can be made according to known principles of ceramic science.

CLAIM 358 (ALLOWED) An apparatus according to anyone of claims 186 or 221, wherein said superconductive oxide composition can be made according to known principles of ceramic science.

CLAIM 359 An apparatus according to anyone of claims 195 or 230, wherein said copper oxide composition can be made according to known principles of ceramic science.

CLAIM 360 An apparatus according to anyone of claims 286 or 321, wherein said copper oxide composition can be made according to known principles of ceramic science.

CLAIM 361 A superconducting apparatus comprising a composition having a transition temperature greater than or equal to 26°K, the composition including a rare earth or an element comprising a rare earth characteristic, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature greater than or equal to 26°K, a means for maintaining said composition at said temperature to exhibit said superconductivity and means for passing an electrical superconducting current through said composition while exhibiting said superconductivity.

CLAIM 362 The superconducting apparatus of claim 361, further including an alkaline earth element substituted for at least one atom of said rare earth or element comprising a rare earth characteristic in said composition.

CLAIM 363 The superconducting apparatus of claim 362, where said rare earth or element comprising a rare earth characteristic is selected from the group consisting of La, Nd, and Ce.

CLAIM 364 The superconducting apparatus of claim 361, where said phase is crystalline with a structure comprising a perovskite characteristic.

CLAIM 365 The superconducting apparatus of claim 362, where said phase is crystalline with a structure comprising a perovskite characteristic.

CLAIM 366 The superconducting apparatus of claim 361, where said phase exhibits a crystalline structure comprising a layered characteristic.

CLAIM 367 The combination of claim 15, where said additional element is a rare earth or an element comprising a rare earth characteristic.

CLAIM 368 The combination of claim 12, where said composition includes a superconducting phase comprising a perovskite characteristic.

CLAIM 369 The combination of claim 20, where said substituted transition metal oxide has a structure comprising a layered characteristic.

CLAIM 370 The superconducting apparatus of claim 31, where said crystalline structure comprises a layered characteristic, enhancing the number of Jahn-Teller polarons in said composite.

CLAIM 371 The superconductive apparatus of claim 48, where said substitutions include a rare earth or an element comprising a rare earth characteristic.

CLAIM 372 A superconductive apparatus comprised of a copper oxide comprising a crystalline structure comprising a layered characteristic and at least one additional element substituted in said crystalline structure, said structure being oxygen deficient and exhibiting a superconducting onset temperature greater than or equal to 26°K.

CLAIM 373 A combination, comprised of:

a copper oxide superconductor having a superconductor onset temperature greater than about 26°K including an element which results in a mixed valent state in said oxide, said oxide being crystalline and comprising a structure comprising a layered characteristic,

means for passing a superconducting current through said copper oxide while it is maintained at a temperature greater than or equal to 26°K and less than said superconducting onset temperature, and

means for cooling said copper oxide to a superconductive state at a temperature greater than or equal to 26°K and less than said superconducting onset temperature.

CLAIM 374 A combination, comprised of:

a material comprising a ceramic characteristic comprising an onset of superconductivity at an onset temperature greater than or equal to 26°K,

means for passing a superconducting electrical current through said material comprising a ceramic characteristic while said material is maintained at a temperature greater than or equal to 26°K and less than said onset temperature, and

means for cooling said superconducting material having a ceramic characteristic to a superconductive state at a temperature greater than or equal to 26°K and less than said onset temperature, said material being superconductive at temperatures below said onset temperature and a ceramic at temperatures above said onset temperature.

CLAIM 375 (ALLOWED) An apparatus comprising a composition exhibiting superconductivity at temperatures greater than or equal to 26°K, said composition being a material comprising a ceramic characteristic in the RE-AE-TM-O system, where RE is a rare earth or near rare earth element, AE is an alkaline earth element, TM is a multivalent transition metal element having at least two valence states in said composition, and O is oxygen, the ratio of the amounts of said transition metal in said two valence states being determined by the ratio RE : AE, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature greater than or equal to 26°K.

CLAIM 376 The combination of claim 71, where said mixed copper oxide further includes a rare earth or an element comprising a rare earth characteristic.

CLAIM 377 (WITHDRAWN) An apparatus comprising a superconductor having a superconducting onset temperature greater than or equal to 26°K, said superconductor being made by a method including the steps of:

preparing powders of oxygen-containing compounds of a rare earth or rare earth-like element, an alkaline earth element, and copper,

mixing said compounds and firing said mixture to create a mixed copper oxide composition including said alkaline earth element and said rare earth or rare earth-like element, and

annealing said mixed copper oxide composition at an elevated temperature less than about 950°C in an atmosphere including oxygen to produce a superconducting composition having a mixed copper oxide phase exhibiting a superconducting onset temperature greater than or equal to 26°K, said

superconducting composition comprising a crystalline structure comprising a layered characteristic after said annealing step.

CLAIM 378 (WITHDRAWN) An apparatus comprising a superconductor having a superconducting onset temperature greater than or equal to 26°K, said superconductor being comprised of a rare earth or an element (RE) comprising a rare earth characteristic, an alkaline earth element (AE), copper (CU), and oxygen (O) and having the general formula RE-AE-CU-O, said superconductor being made by a method comprising the steps of combining said rare earth or element comprising a rare earth characteristic, said alkaline earth element and said copper in the presence of oxygen to produce a mixed copper oxide including said rare earth or rare earth-like element and said alkaline earth element therein, and

heating said mixed copper oxide to produce a superconductor having a crystalline structure comprising a layered characteristic and exhibiting a superconducting onset temperature greater than or equal to 26°K the critical transition temperature of said superconductor being dependent on the amount of said alkaline earth element therein.

CLAIM 379 A combination, comprising:

a mixed copper oxide composition including an alkaline earth element (AE) and a rare earth or element (RE) comprising a rare earth characteristic, said composition comprising a crystalline structure comprising a layered characteristic and multi-valent oxidation states, said composition exhibiting *a* substantially zero resistance to the flow of electrical current therethrough when cooled to a superconducting state at a temperature greater than or equal to 26°K, said mixed copper oxide having a superconducting onset temperature greater than or equal to 26°K, and

electrical means for passing an electrical superconducting current through said composition when said composition exhibits substantially zero resistance at a temperature greater than or equal to 26°K and less than said onset temperature.

CLAIM 380 The combination of claim 379, wherein said crystalline structure comprises a perovskite characteristic.

CLAIM 381 (ALLOWED) An apparatus comprising a superconductor having a superconducting onset temperature greater than or equal to 26°K, said superconductor being comprised of a rare earth or an element (RE) comprising a rare earth characteristic, an alkaline earth element (AE), a transition metal element (TM), and Oxygen (O) and having the general formula RE-AE-TM-O, said superconductor being made by a method comprising the steps of combining said rare earth or element comprising a rare earth characteristic, said alkaline earth element and said transition metal element in the presence of oxygen to produce a mixed transition metal oxide including said rare earth or element comprising a rare earth characteristic and said alkaline earth element therein, and

heating said mixed transition metal oxide to produce superconductor having a crystalline structure comprising a layered characteristic and exhibiting a superconducting onset temperature greater than or equal to 26°K, said superconductor having a non-stoichiometric amount of oxygen therein.

CLAIM 382 The apparatus of claim 93, where said copper oxide material exhibits a crystalline structure comprising a layered characteristic.

CLAIM 383 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition comprising a copper-oxide compound having a crystal structure comprising a perovskite characteristic and a layered characteristic, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) means for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element.

CLAIM 384 (ALLOWED) The superconductive apparatus according to claim 383 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or element comprising a rare earth characteristic and at least one alkaline-earth element.

CLAIM 385 (ALLOWED) The superconductive apparatus according to claim 384 in which the rare-earth or element comprising a rare earth characteristic is lanthanum.

CLAIM 386 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one rare-earth or element comprising a rare earth characteristic and at least one alkaline-earth element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range

between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) means for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$ of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element.

CLAIM 387 (ALLOWED) The superconductive apparatus according to claim 386 in which the rare-earth or an element comprising a rare earth characteristic is lanthanum.

CLAIM 388 (ALLOWED) An apparatus comprising:

a composition including a transition metal, a rare earth or an element comprising a rare earth characteristic, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition in said superconducting state at a temperature greater than or equal to 26°K, and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

CLAIM 389 A superconductive apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) causing an electric current to flow in the superconductor element.

CLAIM 390 (ALLOWED) The superconductive apparatus according to claim 389 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or an element comprising a rare earth characteristic and at least one alkaline-earth element.

CLAIM 391 (ALLOWED) The superconductive apparatus according to claim 390 in which the rare-earth or an element comprising a rare earth characteristic is lanthanum.

CLAIM 392 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition having a superconductive/resistive-transition defining a

superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 393 (ALLOWED) The superconductive apparatus according to claim 392 in which the rare-earth or an element comprising a rare earth characteristic is lanthanum.

CLAIM 394 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 395 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=o}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 396 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound

comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 397 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 398 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 399 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 400 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 401 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive-resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 402 An apparatus capable of carrying electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 403 (ALLOWED) An apparatus according to claim 402 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or an element comprising a rare earth characteristic and at least one alkaline-earth element.

CLAIM 404 (ALLOWED) An apparatus according to claim 403 in which the rare-earth or element comprising a rare earth characteristic is lanthanum.

CLAIM 405 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a layer-type perovskite-like crystal structure, the copper-oxide compound comprising at least one rare-earth or element comprising a rare earth

characteristic and at least one alkaline-earth element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 406 (ALLOWED) An apparatus according to claim 405 in which the rare-earth or element comprising a rare earth characteristic is lanthanum.

CLAIM 407 An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 408 An apparatus capable of carrying an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 409 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a

perovskite characteristic, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 410 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 411 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 412 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive

transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 413 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite characteristic, the copper-oxide compound including at least one element selected from the group consisting of a group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element, the composition comprising a superconductive-resistive transition temperature defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 414 A superconducting apparatus according to anyone of claims 361-365 or 366, wherein said composition can be made according to known principles of ceramic science.

CLAIM 415 A superconducting combination according to anyone of claims 367, 368 or 369, wherein said composition can be made according to known principles of ceramic science.

CLAIM 416 A superconducting apparatus according to anyone of claims 370 or 371, wherein said composition can be made according to known principles of ceramic science.

CLAIM 417 A superconducting apparatus according to claim 372, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 418 A combination according to claim 373, wherein said copper oxide can be made according to known principles of ceramic science.

CLAIM 419 A combination according to claim 374, wherein said material can be made by known principles of ceramic science.

CLAIM 420 A apparatus according to claim 375, wherein said composition can be made by known principles of ceramic science.

CLAIM 421 A combination according to claim 376, wherein said mixed copper oxide can be made by known principles of ceramic science.

CLAIM 422 A combination according to anyone of claims 379 or 380, wherein said mixed copper oxide can be made by known principles of ceramic science.

CLAIM 423 A apparatus according to claim 382, wherein said copper oxide material can be made by known principles of ceramic science.

CLAIM 424 A superconductive apparatus according to anyone of claims 383, 384, 385, 386, 387 and 389, wherein said composition can be made by known principles of ceramic science.

CLAIM 425 A apparatus according to claim 388, wherein said composition can be made according to known principles of ceramic science.

CLAIM 426 A superconductive apparatus according to anyone of claims 389 to 400 or 401, wherein said superconductive composition can be made by known principles of ceramic science.

CLAIM 427 A apparatus according to anyone of claims 402 to 412 or 413, wherein said superconductive composition can be made by known principles of ceramic science.

CLAIM 428 An apparatus capable of carrying electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

a superconductive element comprising a superconductive composition, said superconductive composition comprising O and at least one element selected from the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu; and

said composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K.

CLAIM 429 An apparatus according to claim 428, further including:

a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

a source of an electric current to flow in the superconductor element.

CLAIM 430 An apparatus according to claim 428, wherein said composition comprises a substantially layered structure.

CLAIM 431 An apparatus according to claim 429, wherein said composition comprises a substantially layered structure.

CLAIM 432 An apparatus according to anyone of claims 428 to 430 or 431, wherein said composition comprises a substantially perovskite crystal structure.

CLAIM 433 An apparatus according to any one of claims 428 to 430 or 431, wherein said composition comprises a perovskite-like structure.

CLAIM 434 An apparatus according to any one of claims 428 to 430 or 431, wherein said composition comprises a perovskite characteristic.

CLAIM 435 An apparatus according to any one of claims 428 to 430 or 431, wherein said composition comprises a perovskite related structure.

CLAIM 436 An apparatus according to anyone of claims 428 to 431 or 432, wherein said composition can be made according to known principals of ceramic science.

CLAIM 437 An apparatus according to claim 88 wherein said composition is an oxide.

CLAIM 438 An apparatus comprising: a means for conducting a superconducting current at a temperature greater than or equal to 26°K and a means for providing an electric current to flow in said means for conducting a superconducting current.

CLAIM 439 An apparatus according to claim 438, wherein said means for conducting a superconductive current comprises a T_c greater than or equal to 26°K.

CLAIM 440 An apparatus according to claim 438, further including a temperature controller for maintaining said means for conducting a superconducting current at a said temperature.

CLAIM 441 An apparatus according to anyone of claims 438, 439 or 440, wherein said means for conducting a superconducting current comprises oxygen.

CLAIM 442 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises one or more of the groups consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 443 An apparatus according to anyone of claims 438, 439 or 440, wherein said means for conducting a superconducting current comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 444 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a layered structure.

CLAIM 445 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a substantially perovskite structure.

CLAIM 446 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a perovskite-like structure.

CLAIM 447 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a perovskite related structure.

CLAIM 448 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a structure having a perovskite characteristic.

CLAIM 449 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a transition metal.

CLAIM 450 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a copper oxide.

CLAIM 451 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises oxygen in a nonstoichiomeric amount.

CLAIM 452 An apparatus according to anyone of claims 438, 439 and 440, wherein said means for conducting a superconducting current comprises a multivalent transition metal.

CLAIM 453 An apparatus according to anyone of claims 438, 439 or 440, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 454 An apparatus according to claim 441, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 455 An apparatus according to claim 442, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 456 An apparatus according to claim 443, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 457 An apparatus according to claim 444, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 458 An apparatus according to claim 445, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 459 An apparatus according to claim 446, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 460 An apparatus according to claim 447, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 461 An apparatus according to claim 448, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 462 An apparatus according to claim 449, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 463 An apparatus according to claim 450, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 464 An apparatus according to claim 451, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 465 An apparatus according to claim 452, wherein said means for conducting a superconducting current can be made according to known principles of ceramic science.

CLAIM 466 An apparatus comprising:

a superconductive current carrying element comprising a T_c □ 26□K;

said superconductive current carrying element comprises a property selected from one or more of the group consisting of a mixed valent oxide, a transition metal, a mixed valent transition metal, a perovskite structure, a perovskite-like structure, a perovskite related structure, a layered structure, a stoichiomeric or nonstoichiomeric oxygen contents and a dopant.

CLAIM 467 An apparatus according to claim 466, wherein said superconductive current carrying element is at a temperature greater than or equal to 26□K.

CLAIM 468 An apparatus according to claim 466, further including a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

CLAIM 469 An apparatus according to anyone of claims 466, 467 or 468, wherein said superconductive current carrying element comprises one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 470 An apparatus according to anyone of claims 466, 467 or 468, wherein said superconductive current carrying element comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 471 An apparatus according to claim 469, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 472 An apparatus according to claim 470, wherein said superconductive current carrying element comprises a transition metal

CLAIM 473 An apparatus according to anyone of claims 466, 467, or 468, wherein said superconducting current carrying element can be made according to known principles of ceramic science.

CLAIM 474 An apparatus according to of claim 471, wherein said superconducting current carrying element can be made according to known principles of ceramic science.

CLAIM 475 An apparatus according to of claim 472, wherein said superconducting current carrying element can be made according to known principles of ceramic science.

CLAIM 476 An apparatus comprising:

a superconductive current carrying element comprising a T_c □ 26□K;

said superconductive current carrying element comprises an oxide, a layered perovskite structure or a layered perovskite-like structure and comprises a stoichiomeric or nonstoichiomeric oxygen content.

CLAIM 477 An apparatus according to claim 476, wherein said superconductive current carrying element is at a temperature greater than or equal to 26□K.

CLAIM 478 An apparatus according to claim 476, further including a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

CLAIM 479 An apparatus according to anyone of claims 476, 477 or 478, wherein said superconductive current carrying element comprises one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 480 An apparatus according to anyone of claims 476, 477 or 478, wherein said superconductive current carrying element comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 481 An apparatus according to claim 479, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 482 An apparatus according to claim 480, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 483 An apparatus according to claim 476, wherein said superconductive current carrying element comprises copper oxide.

CLAIM 484 An apparatus according to anyone of claims 476, 477 or 478, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 485 An apparatus according to claim 479, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 486 An apparatus according to claim 480, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 487 An apparatus according to claim 481, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 488 An apparatus according to claim 482, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 489 An apparatus according to claim 483, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 490 An apparatus according to claim 484, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 491 An apparatus according to claim 485, wherein said superconductive current carrying element can be made according to known principles of ceramic science.

CLAIM 492 The superconducting apparatus of claim 361, where said phase is crystalline with a structure comprising a perovskite related structure.

CLAIM 493 The superconducting apparatus of claim 362, where said phase is crystalline with a structure comprising a perovskite related structure.

CLAIM 494 The combination of claim 12, where said composition includes a superconducting phase comprising a perovskite related structure.

CLAIM 495 The combination of claim 379, wherein said crystalline structure comprises a perovskite related structure.

CLAIM 496 A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition comprising a copper-oxide compound having a crystal structure comprising a perovskite related structure and a layered characteristic, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) means for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element.

CLAIM 497 A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one rare-earth or element comprising a rare earth characteristic and at least one alkaline-earth element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) means for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{q=o}$ of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element.

CLAIM 498 A superconductive apparatus for causing electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) causing an electric current to flow in the superconductor element.

CLAIM 499 A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one rare-earth or rare-earth-like element and at least one alkaline-earth element, the composition having a superconductive/resistive-transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 500 An apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 501 An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound

comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=o}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 502 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 503 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 504 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 505 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk- resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 506 (ALLOWED) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition having a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes a Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 507 (ALLOWED) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound

comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including Group II A element, and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive-resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

CLAIM 508 An apparatus capable of carrying electric current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition comprising a superconductor transition temperature T_c of greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 509 An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element, a rare earth element; and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 510 An apparatus capable of carrying an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity

intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

CLAIM 511 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 512 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound

comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 513 (ALLOWED) An apparatus capable of carrying an electric-current flow in a superconductive state at a temperature greater than or equal to 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the composition comprising a superconductive transition temperature T_c of greater than or equal to 26°K, said superconductive composition includes at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller for maintaining the superconductor element at a temperature greater than or equal to 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 514 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the transition metal-oxide compound including at least one element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition comprising a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 515 (ALLOWED) An apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound comprising a crystal structure comprising a layered characteristic and a perovskite related structure, the copper-oxide compound including at least one element selected from the group consisting of a group II A element, at least one element selected from the group consisting of a rare earth element and at least one element selected from the group consisting of a Group III B element, the composition comprising a superconductive-resistive transition temperature defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than or equal to 26°K;

(b) a temperature controller for maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a source of an electric current to flow in the superconductor element.

CLAIM 516 An apparatus of claim 146 wherein said means for carrying a superconductive current is comprised of an oxide.

CLAIM 517 An apparatus comprising:

a superconductive current carrying element comprising a T_c □ 26□K;

said superconductive current carrying element comprises a metallic, oxygen-deficient, perovskite-like, mixed valent copper compound.

CLAIM 518 An apparatus according to claim 517, wherein said superconductive current carrying element is at a temperature greater than or equal to 26□K.

CLAIM 519 An apparatus according to claim 517, further including a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

CLAIM 520 An apparatus according to anyone of claims 517, 518 or 519, wherein said superconductive current carrying element comprises one or more of the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho Er, Tm, Yb and Lu.

CLAIM 521 An apparatus according to anyone of claims 517, 518 or 519, wherein said superconductive current carrying element comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 522 An apparatus comprising:

a superconductive current carrying element comprising a T_c □ 26□K;

said superconductive current carrying element comprises a composition that can be made according to known principles of ceramic science.

CLAIM 523 An apparatus according to claim 522, wherein said superconductive current carrying element is at a temperature greater than or equal to 26□K.

CLAIM 524 An apparatus according to claim 523, further including a temperature controller for maintaining said superconductive current carrying element at a temperature less than said T_c.

CLAIM 525 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises one or more of

the group consisting of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 526 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises one or more of Be, Mg, Ca, Sr, Ba and Ra and one or more of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

CLAIM 527 An apparatus according to claim 525, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 528 An apparatus according to claim 526, wherein said superconductive current carrying element comprises a transition metal.

CLAIM 529 An apparatus according to claim 522, wherein said superconductive current carrying element comprises copper oxide.

CLAIM 530 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element is substantially perovskite.

CLAIM 531 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises a perovskite-like structure.

CLAIM 532 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises a perovskite related structure.

CLAIM 533 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises a nonstoichiometric amount of oxygen.

CLAIM 534 An apparatus according to anyone of claims 522, 523 or 524, wherein said superconductive current carrying element comprises a layered structure.

CLAIM 535 An apparatus comprising a superconductor exhibiting a superconducting onset at an onset temperature greater than or equal to 26°K, said superconductor being comprised of at least four elements, none of which is a means for carrying a superconducting current at a temperature greater than or equal to 26°K, means for maintaining said superconductor at an operating temperature in excess of said onset temperature to maintain said superconductor in a superconducting state and means for passing current through said superconductor while in said superconducting state.

CLAIM 536 An apparatus comprising:

a means for carrying a superconductive current exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a cooler for cooling said composition to a temperature greater than or equal to 26°K at which temperature said means for carrying a superconductive current exhibits said superconductive state, and

a current source for passing an electrical current through said composition while said composition is in said superconductive state.

CLAIM 537 An apparatus comprising:

a metallic, oxygen-deficient, perovskite-like, mixed valent transition metal composition exhibiting a superconductive state at a temperature greater than or equal to 26°K,

a temperature controller maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a current source passing an electrical current through said composition while said composition is in said superconductive state.

CLAIM 538 The apparatus of claim 537, where said means for carrying a superconductive current is comprised of a metal oxide.

CLAIM 539 The apparatus of claim 537, where said means for carrying a superconductive current is comprised of a transition metal oxide.

CLAIM 540 An apparatus comprising:

a composition comprising oxygen exhibiting a superconductive state at a temperature greater than or equal to 26°K, a temperature controller for maintaining said composition at a temperature greater than or equal to 26°K at which temperature said composition exhibits said superconductive state, and

a source of an electrical current through said composition while said composition is in said superconductive state.

CLAIM 541 An apparatus according to claim 540, where said composition is comprised of a metal oxide.

CLAIM 542 An apparatus according to claim 541, where said composition is comprised of a transition metal oxide.

CLAIM 543 A combination, comprising:

an oxygen containing composition exhibiting the onset of a DC substantially zero resistance state at an onset temperature in excess of 30°K, and

means for passing an electrical current through said composition while it is in said substantially zero resistance state.

CONCLUSION

In view of the argument herein Applicants respectfully request that the Board reverse the rejection of claims 1-64, 66-72, 84, 85, 88-96, 100-102, 109-112, 115-122, 126-134, 139, 141-143, 146-149, 153-155, 162-166, 182-184, 187, 188, 192-195, 198-212, 217-219, 222, 223, 227-230, 232-234, 237-240, 244-246, 253-257, 268, 273-275, 278, 279, 283-286, 289-295, 302, 303, 308-310, 313, 314, 318-329, 331-334, 337-345, 347-357, 359-374, 376, 379, 380, 382, 383, 389, 394, 395, 402, 407, 408, 414-501, 508-510, 515-543 as not enabled under 35 USC 112, first paragraph.

In view of the arguments herein Applicants respectfully request that the Board grant Applicants' claim of priority to the Priority Document or to enter into the record a statement that Applicants' claim of priority does not have to be decided on to decide the issues raised by this appeal.

Please charge any fee necessary to enter this paper and any previous paper to deposit account 09-0468.

Respectfully submitted,

Dr. Daniel P. Morris, Esq.
Reg. No. 32,053
(914) 945-3217

IBM CORPORATION
Intellectual Property Law Dept.
P.O. Box 218
Yorktown Heights, New York 10598